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ABSTRACT

This project developed and tested a computer-based instructional program designed to increase the number of positive, academic student/teacher interactions exhibited in mainstreamed regular classrooms by mildly handicapped elementary students. The program, called Teacher Net, integrated a microcomputer-controlled videodisc system, a system of inexpensive keyboards allowing input from individual students in response to group instruction, and microcomputer software to evaluate student responses and develop specific work assignments for individual students. Using the Teacher Net system, an instructional program was developed to teach time-telling skills. The system was tested among regular education students, learning-disabled (LD) students, and regular education controls. Groups using the Teacher Net system showed substantial gains on posttest measures. LD and regular students completed the program at approximately the same pace, and LD subjects scored almost as high as regular students on posttest drills. Appendixes contain management system time lines, hardware and software descriptions and operating procedures, and a time telling skills test. (18 references) (PB)

Part I - PROJECT IDENTIFICATION

All grantees are required to complete Part I of the Performance Report.

Date of Report:	Grant Number:	Period of Report:
December 22, 1987	G008402242	From: 8/1/84 To: 3/31/86

Grantee Name and Descriptive Title of Project:

Development and Testing of a Videodisc/Teacher Net System for Mildly Handicapped Students.

CERTIFICATION: I certify that to the best of my knowledge and belief this report (consisting of this and subsequent pages and attachments) is correct and complete in all respects, except as may be specifically noted herein.

Typed Name of Project Director(s) or Principal Investigator(s):	Signature of Project Director(s) or Principal Investigator(s):
Ron J. Thorkildsen, Ph.D.	

PART II - PROJECT SUMMARY

All grantees are required to complete Part II of the Performance Report.

All grantees are to compare (in a narrative format) actual accomplishments over the grant award period to objectives contained in the originally approved grant application and, when appropriate, subsequently approved continuation applications. In addition to discussing project/program accomplishments and milestones, grantees should discuss slippages in attainment of program objectives and target dates and reasons for slippages where any differences occurred between originally stated objectives and the actual outcome of activities. This includes any failure to carry out all funded activities. When the output of the grant can be readily quantified, such data should be included -- and related to cost data for the computation of unit costs. When appropriate, utilize quantitative projections, data collected, criteria, and methodologies used to evaluate project/program accomplishments. Discuss reports made by or to professional journals, other publications, and professional conferences.

Grantees are also encouraged to highlight those phases, strategies, or products of their project/program which proved most successful.

Further monies may be withheld under these programs unless this report is completed and filed according to existing law and regulations (34 CFR Part 300).

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Project Information

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Disclaimer

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Introduction

Purpose of Project

The purpose of the project, as stated in the proposal, was to develop and test a computer-based instructional program designed to increase the number of positive, academic, student/teacher interactions exhibited in mainstreamed, regular classrooms by mildly handicapped students. This program was to integrate three systems: a microcomputer controlled videodisc system; a system of inexpensive keyboards allowing input from individual students in response to group instruction (Teacher Net); and microcomputer software which evaluates student responses and develops specific work assignments for individual students. The resulting integrated system is referred to as the Teacher Net program. The Teacher Net program was to be tested by measuring the student/teacher interactions and the academic performance of students utilizing the program.

Only a portion of the project was funded. Because of insufficient funds, only the development of the system and preliminary field testing were funded. The objective to measure the effects of the program on academic performance, interaction patterns, and teacher and peer attitudes toward handicapped children was not included in the final proposal. The project was reduced from the proposed two years to 18 months. The reduction in funding also eliminated most of the dissemination activities and the final production of the videodiscs. The following two objectives from the original proposal were included in the funded proposal:

1. An instructional program which teaches time telling skills using a Videotape-based Teacher Net system will be developed.

2. The program will be field tested. Based upon the results of the field test, a revised program will be completed and a videodisc pressed.

In addition to these two objectives, an additional objective was added by the project staff. It was decided to design the videodisc program so that it could be used both in a Level III and in a Level I application. The two Levels would then be compared. (A description of these levels of application is contained in the Methods Section.) The essential difference between the levels is that Level III uses a computer to control the videodisc player and a Level I uses manual control through the use of the videodisc player's hand held, remote control unit.

The proposed Teacher Net system would be a Level III application, and a comparison of Level I and Level III would substantially add to the knowledge about group instruction with a videodisc. The development and comparison would also provide valuable information about videodisc design. It was determined that the Level I/Level III videodisc could be produced within the cost structure of the project.

In addition to the three objectives, a doctoral dissertation study was conducted during the project using the videodisc produced through this project. The objective of the dissertation study was to examine the effectiveness of three levels of informative feedback on the acquisition and retention of time telling skills (Pitcher, 1986). A brief description of the study is presented in the Results Section of this report.

Rationale for Project

The regular classroom is viewed as the least restrictive environment for many mildly handicapped students. The least restrictive environment has been characterized by Heron and Skinner (1981) as a place where (1) the handicapped student's opportunity to respond and achieve is maximized (2) the classroom teacher can give a roughly equal amount of attention to all students in the classroom and (3) acceptable social relations between handicapped and non-handicapped students are fostered. There is evidence that many mainstreamed regular classrooms may not have these characteristics (Bryan, 1974; Bryan & Wheeler, 1972; Chapman, 1975; Fink, 1977; Wherry & Quay, 1969).

There is a need for group-based instruction which would improve the experiences of mildly handicapped children in mainstreamed classrooms. Computer-based instruction can be designed which may make the handicapped child's experiences in the mainstreamed classroom more positive and academic in nature. This might be accomplished through a networking system which allows each student to make individual responses to the instruction and provides the teacher with information about each student's response.

Previous Classroom Networking Systems

There have been a number of attempts to develop electronic systems to improve student/teacher communication. Muller (1966) reported on a computer-assisted system that could be used to query college students on lecture topics at key times during class. Their answers were reported immediately to the

lecturer. The lecturer could then modify his presentation in light of the students' responses. Corrigan (1963) and Crossman (1963) reported on a similar system designed for use in a public school setting. These early efforts were not widely adopted by either public schools or colleges.

Causes of Networking System Failure

Three general causes for this lack of adoption have been suggested. The first involves teacher planning. Teachers using this type of system were required to build their lessons around a set of questions. Those questions were designed to identify student knowledge and/or misconceptions at appropriate times during the lecture. Someone had to take the time to develop lessons and the accompanying graphics (overheads or slides) used to deliver the questions to the students. Many teachers were unable or unwilling to spend the time needed to develop the lessons and graphics this type of a system required.

Second, a series of hardware shortcomings discouraged those who tried the systems. The systems were expensive, cumbersome, and unreliable. Cheating was easy. Students tripped over cords, pulling system components to the floor. When a system required the use of a mainframe computer, communications between the equipment in the field and the computer were not particularly reliable.

Finally, the early systems did not provide the assistance that instructors needed to use the feedback effectively. Knowing that students do not understand a lecture is one thing,

knowing what to do about it is quite another. There is some evidence that teachers were unable to modify their lectures in a systematic or effective way.

The Planning Issue. Extensive teacher planning with electronic systems is an unrealistic expectation, and there are a variety of techniques that can be utilized to eliminate extensive planning prior to instruction. One such technique involves the use of pre-programmed videodisc-based instruction which could be used in group settings. Videodisc technology allows for the use of motion pictures, audio, and graphics in instructional prosentation. In addition, the branching capability of a microcomputer-controlled videodisc allows instructional programs that include questions to identify childrens' misconceptions and then provide specific correctional procedures to meet the students' individual needs.

Research staff at Utah State University through the Interactive Videodisc for Special Education Technology (IVSET) Project have developed and field tested a microcomputer/ videodisc (MCVD) System (Thorkildsen, 1982; Thorkildsen & Friedman, 1984). Additionally, a number of videodisc programs have been developed to teach individual handicapped children such skills as time telling.

The Time Telling program was field tested with first and second grade students who had been classified as learning disabled (Friedman & Hofmeister, 1983). Pretest results indicated that none of the students (N=4) could tell time before starting the program. The students completed the program in six weeks and, based upon the results of a posttest,

were found to be accurate time tellers. Videodisc/microcomputer programs of this sort remove the burden of developing instruction that is compatible with a networking system.

Hardware Problems. There are now available a number of reliable, low-cost instructional networking systems. Cannine (1983) and Reese (1983) report on a system which uses a microcomputer-controlled network with up to 31 inexpensive student keyboards. The keyboards are connected to a device which manages the flow of information and maintains the identification of each keyboard. The information is then displayed by a microcomputer on a screen. Then, individual student responses are reported to the teacher, and stored by the microcomputer for subsequent individual and summary reporting.

A similar system has been developed by Reactive Systems Incorporated. Either system has the potential to greatly reduce or eliminate the problems encountered with the earlier electronic classroom communications systems.

Using the Information. The instructional programming used with a network system must help the teacher use the information supplied through the network. Microcomputer or computer-controlled videodisc-based instructional programs use a computer to present an instructional program and to make program presentation decisions which are based upon student responses. They can also be programmed to cue the teacher to reinforce certain students, suggest appropriate correction procedures for individual students or sub-groups of students,

and choose appropriate instructional branches. In addition, a computer can be programmed to suggest appropriate topics and levels of class discussion, as well as appropriate homework, as indicated by test results or student responses.

As noted earlier, the purpose of the project was to develop a computer-based networking system that would provide group instruction while allowing individual input from each student. Project personnel felt that the obstacles encountered in earlier attempts to use network systems could be solved by using a videodisc presentation to present the instruction and by designing software which would control the presentation and provide the teacher with information about individual student progress.

The project was conducted at the Developmental Center for Handicapped Persons at Utah State University from August 1, 1984 to March 31, 1986. A cooperative agreement was arranged with IBM to supply the computer equipment.

Objectives and Activities

This section lists the objectives and activities as stated in the proposal and provides a brief description of how project staff completed each activity. Extra detail is provided in the activity descriptions for those readers interested in the videodisc production process. Each step of the process from conception to videodisc pressing is included in outline form. Additional information concerning the production process, hardware, and fieldtesting is contained in narrative form in the Methods Section.

Objective 1

An instructional program which teaches time telling skills using a Videotape-based Teacher Net system will be developed.

Activity 1.1--Modify existing Time Telling Program.

A videodisc based Time Telling program had been produced for a previous research project. This research provided information on academic effectiveness of the Time Telling instruction and on revisions to improve the program. Thus, the new program could be improved by incorporating the suggested changes.

The original program did not contain the audio required to respond to group responses. For instance, the original time telling program asked the students to touch the screen which obviously would not work with the network of keypads. The revision information combined with additional requirements of the network provided the framework for designing the revised

videodisc program. The activities accomplished to modify the existing time telling program and produce a new videodisc may be of interest to persons interested in producing a videodisc. Therefore, these activities are listed in outline form below:

A. Review the original time telling videodisc, script, and parameter listings,
B. Review the original paper and pencil time telling program from which the original videodisc was designed,
C. Develop ideas for formatting the videodisc for both Levels I and III,
D. Develop initial formatting plans and ideas,
E. Develop and field test resulting design with the videotape version for the first two lessons:
    1. Write scripts for lessons 1 and 2.
    2. Prepare for production of lessons 1 and 2.
    3. Tape narration for both Lessons.
    4. Write narration for introduction and transitions.
    5. Tape narration for introduction and transitions.
    6. Develop graphics for both lessons.
    7. Output graphics to videotape for both lessons.
    8. Develop graphic screens.
    9. Edit master tape for both lessons.
    10. Dub master tapes to 1/2" Beta Format & 1/2" VHS with time code burned in.
    11. Get frame numbers off tapes.
    12. Prepare programming sheets for both lessons - frame numbers to parameter data.
    13. Enter parameter data on computer.
    14. Debug program/VTMI Board will not work decision is made to run field test manually.
    15. Field test - version one (long).
    16. Review field test results - decisions for revision.
    17. Revise lessons 1 and 2.
    18. Field test - version two (short).
    19. Review field test results.
    20. Write scripts for Lessons 1-9.
    21. Write narration for introductions and trasitions.
    22. Tape narration for lessons, introductions, and transitions for all nine lessons.
    23. Send master tapes to be pressed into DRAW discs.

Activity 1.2--Select and Implement Teacher Net Hardware.

The microcomputer, the device required for interfacing the computer and the videodisc player, and the keyboard network were selected based on applicability and commercial availability. Hardware selected was an IBM PC, Pioneer 4000

videodisc player and the Systems Impact VID-232 interface device. A networking system from Reactive Systems was also selected. The hardware is described in more detail in the Methods Section.

Activity 1.3--Develop Teacher Net Software.

The Networking software was used to control the presentation of the videodisc material, manage the responses from the keyboard system, and store individual response data for use by the assignment generating software. The software was written in the C computer language.

Activity 1.4--Develop Assignment Generating Software.

This computer software used the individual response data to make additional assignments to bring each individual child to mastery on each objective. This software also produced reports of student progress.

Activity 1.5--Develop Teacher Training Materials.

Because the videodisc presentation contains sequenced instructional procedures with directions for branching, the program is very easy to use. Teacher training was minimal. The teacher training materials consisted of a set of operation procedures which was sufficient to use the program to teach time telling. Operation procedures for both Level I and Teacher Net are contained in Appendix F. Operation procedures for Level I are contained in Appendix G.

Objective 2

The program developed in objective 1 will be field tested. Based upon the results of the field test, a revised program

will be completed, and a videodisc pressed.

Activity 2.1--Conduct Initial Small Sample Field Test.

The purpose of the initial field test was to establish the reliability of the hardware system in a classroom as well as to identify problems encountered by either the teachers or students. Additional information on this field test is included in the Methods Section.

Activity 2.2--Modify Hardware.

The interactive videotape system could not be made operational because of a malfunctioning interface board. Fixing this board would have caused a major delay in the project, and therefore the initial field test was conducted with a manually controlled videotape player. A second small field test was conducted after the videodisc had been produced to test the Teacher Net hardware. A hardware error was detected in the interface device and was corrected. After this correction, the hardware proved to be reliable throughout the field test, and no modifications were required.

Activity 2.3--Modify Program

Based on the results of the second small field test, the computer program was modified. The major modification consisted of the addition of a timing algorithm which limited the amount of time allowed for a response.

Activity 2.4--Conduct Second (Main) Field Test.

Three additional field tests were conducted (1) with a group of regular education first graders, (2) with a group of learning disabled first and second graders, and (3) with a

groups of regular education second graders using a Level I system. These field tests are described in the Methods Section and the results of these field tests are discussed in the Results Section.

Activity 2.5--Modify Hardware.

Additional hardware modifications were not required.

Activity 2.6--Modify Program.

The first "RLV" videodisc developed problems during the first of the Main field tests. (See Methods Section for a description of RLV). A second "RLV" videodisc was produced which included the addition of short entertainment segments which could be used for feedback. Entertainment feedback was presented when all students made correct responses (see Methods Section for information concerning feedback). Appendix G contains a brief description of each of the final seven lessons.

Activity 2.7--Modify Teacher Training Materials.

It was not necessary to modify the teacher training procedures for the Teacher Net system. Information was collected during the field tests, however, to assist with the development of teacher training procedures that would be used with a Level I videodisc system (see Methods Section for a description of a Level I system).

Activity 2.8--Disseminate Project Findings.

Presentations concerning the project were made at four national conferences. (See Dissemination Section).

Project Management

The ongoing evaluation of activities required the use of a

systematic management system. The computer-based management and monitoring (M & M) system was developed and is utilized at the Developmental Center for Handicapped Persons to manage complex projects. It can be used for both planning and monitoring project activities. It provides a format for specifying project objectives and activities, persons responsible for those activities, and timelines associated with each activity; and the system provides for a systematic monitoring process facilitated by computerization.

The M & M system was used to help manage this project. Responsibility assignments were made for each activity and recorded in the system. One of the reports from the system is a graphic timeline which shows the relationship between activities, activity duration and responsibility assignments. An example of a timeline for a subcomponent of the project is contained in Appendix A.

Methods

Videodisc Production

Videodisc Levels

There are a number of options for controlling or operating a videodisc player. These are typically referred to as levels of interactivity and are described below:

Level I - The videodisc player is controlled manually with a remote control device. This device has function keys for each of the player's operations. For example, to search for a particular frame on the disc, the operator enters the frame number on the remote control device and pushes the search key to initiate the search. After finding the desired frame, the operator has numerous options such as forward or reverse play, single frame display, slow motion play or regular play with or without audio from either or both of the audio tracks. All of these functions are accessible with the remote control device.

Level II - Some educational/industrial models such as the Pioneer LDV 6000 have built-in microprocessors. All functions mentioned above can be controlled by this microprocessor. The flow of the presentation is controlled by the logic in the computer program and by input from a user with the remote control device.

Level III - The videodisc player is interfaced with an external computer. The logic of the presentation is determined by the computer program in the external computer, and by input from the user, usually entered through the computer's keyboard. This is advantageous because the computer can supply text and graphics in addition to the still frames and motion supplied by the videodisc. Additionally, student progress data can be collected and stored on an external storage device such as a floppy disc. Typically microcomputers are used as the external computer, and videodisc interfacing is now possible with all popular personal computers.

Level I/Level III Production Considerations.

Producing a videodisc that will function as both a Level I and a Level III requires design considerations different than those required for a videodisc intended for one or the other Level. Screen design is particularly important in Level I/Level III design. This is especially true when questions are

presented and responses expected. With Level I, students respond verbally by stating the answer or recording it on an answer sheet. With Level III, students must respond by entering their answer through a computer keyboard. To facilitate this type of response on the Timetelling videodisc, students were given a choice of possible answers which could be entered with a single key stroke. This was made possible by displaying a choice of four possible answers along with the questions. The choices were labelled A, B, C, or D. This method allowed for a Level III response and for a variety of Level I responses.

It was also necessary to include on many screens a step or play symbol to facilitate Level I branching. The symbols had to be easy to identify for a Level I user, but not distracting for a Level III user. This was accomplished by using a small circle with the word play in it and a small triangle with the word step in it. These symbols were usually placed in the left hand corner near the bottom of the screen and were sufficiently large to be seen by a Level I user, but not distracting to a Level III user.

Providing feedback was also an important consideration. Level I use was the dominant factor in determining how this would be approached. Considering that feedback should be presented immediately after the questions, it was necessary to physically position the feedback segment immediately after the question in order to eliminate the need for a Level I user to constantly search to another spot in the videodisc in order to access the feedback. At the same time it is also necessary to

conserve videodisc space. This issue was resolved by showing the correct answer visually without any accompanying audio cues. The single frame feedback was placed immediately following each questions on the videodisc. Although this didn't utilize the maximum capabilities of Level III, it did facilitate both levels and conserved videodisc space.

Level I considerations also became the dominant factor in controlling how information was organized on the videodisc space. To minimize the amount of searching required by a Level I user, the instructional and feedback material were put on the videodisc in a very linear fashion. This did not utilize the maximum capabilities of Level III, but it did facilitate use of the videodisc at both Level I and Level III. A brief description of the resulting videodisc program is contained in Appendix F.

Recordable Laser Videodisc (RLV)

In general it costs approximately $2000 per side to have a videotape made into a videodisc. The process is called "mastering" the disc. Once a master is made, relatively inexpensive copies can be made -- typically about $12.00 per videodisc. This type of videodisc is referred to as a "Replicable" videodisc.

The $4000 cost for a two-sided Replicable Videodisc is prohibitive if the purpose of the videodisc is for field testing which may result in the need to revise the videodisc. This cost problem has recently been solved with the advent of the Recordable Laser Videodisc (RLV).

The RLV is a single sided recordable videodisc which cost

$300 for one copy. (Additional copies also cost $300) A Direct Read After Write (DRAW) optical system is employed in the recording process to allow information to be read as it is written. This allows for continuous monitoring and recording process control. RLVs are recorded in the IEC LaserVision standard format and can be played on standard LaserVision players. The quality of RLV's is not equal to regular videodiscs, but they do deliver images of good quality with moderately low dropout rates, and they cost approximately one seventh as much to master as a regular videodisc. Because the physical structure of the RLV's is different from a Replicable Videodisc, it requires greater care in handling and storage. RLV videodiscs were selected for use with the TCH/NET Project to conduct the field tests.

Networking System

The Networking System consists of a microcomputer, multi-input system, two monitors, a videodisc player, and microcomputer software written in the C language. Appendix B contains a graphical description of the system.

The microcomputer was an IBM PC, the videodisc player was a Pioneer 6000, and the multi-input system was produced by Reactive Systems. (The Reactive Systems system is described in Appendix C). IBM Corporation supplied two IBM PC's which were used in the development and field testing.

The Networking system allows up to 15 students in a group to respond to videodisc instruction. The videodisc player and monitor allow for the use of motion pictures, audio, high quality still frame, and graphics in instructional

presentation. The branching capabilities of the microcomputer-controlled videodisc can provide correction and video reinforcer sequences according to the group's performance. Responses are made using keypads which are connected to a device which manages the flow of information and maintains the identification of each keypad. The keypads were inexpensive telephone, 12 key keypads ($7.00 each). The software which controlled the videodisc presentation and received input through the network of keypads was programmed in the C computer language. A description of the programs is contained in Appendix D. Listings of the programs are available from the authors.

During an instructional session, a second monitor attached to the microcomputer displays individual and group performance statistics immediately following each item. When the session is complete, the data analysis software provides the teacher with a printed report on both the performance of the group and individuals within the group as well as worksheet prescriptions for remediation or consolidation based on their individual performance. A graphical depiction of the microcomputer programs and the data files is contained in Appendix D. Program listing are available but not included in this report.

Level 1 System.

To conduct the Level I instruction, each teacher had a 21 inch television and a videodisc player located in the front of the classroom. The teacher controlled the videodisc player with the remote hand control unit. The remote hand control

unit uses an infrared signal which allows the teacher to control the videodisc player from anywhere in the classroom. This in turn allows the teacher to work with individual students while the instruction is being presented on the television screen. In addition to instruction on time telling, which is presented to the students, instructions to the teacher are also contained on the videodisc.

To play a particular lesson from the videodisc, the teacher types a brief command on the remote control unit. Each lesson begins with an instructional section which presents the basic concepts of telling time. Following the instructional section, students work through a series of practice problems presented on the videodisc. During the practice section, students respond by recording their answers on a practice answer sheet. The teacher advances the videodisc one frame at a time, first showing the practice problem; and then when all students have responded on their answer sheets, the teacher advances the videodisc one frame revealing the correct answer to the practice problem. A quiz is then presented by the videodisc at the end of the lesson. Students again respond by recording their answers on a quiz answer sheet. The teacher advances the videodisc one frame at a time allowing ample time for students to respond to each quiz problem. Following the quiz, the teacher corrects the work. Information from the quiz allows the teacher to determine if the class is ready to go on to the next lesson.

Formative Field Tests

The Time Telling Videodisc is based on the Programmed Time

Telling package (Hofmeister, 1969). Adapting this paper-pencil type program to videodisc format resulted in the following questions: How should the skills be presented in the videodisc format? How many examples would be needed to teach each skill? Would an audio cue be required for all practice problems? How should feedback in the form of the correct answer be presented? How should remediation activities be handled? How would students be required to respond to questions? Would we be able to achieve generalization from work on the videodisc to practice work with paper-pencil activities? Could the skills be taught in the same order in the same manner and with the same emphasis as the paper-pencil program? A videotape version of a portion of the Time Telling program was produced and field tested to help resolve some of these questions.

The first two lessons were used for the videotape version. Graphics were used to present information using a highlighting technique to draw attention to important points. A narrator presented information during instructional sections with the audio cues being dropped during practice problems. The correct answer was presented visually and immediately following each problem. Students were to respond to questions by selecting one of four possible choices presented on the screen and typing in their response on the computer. No remediation was built into the lesson itself. A paper and pencil activity was given following work with the videotape lesson. The videotape player was controlled by one of the researchers using a remote control unit; starting and stopping the tape as necessary.

Field Test Version 1.

A test was developed to test for time telling skills. This test was given twice, at two separate times, prior to starting the field test to check its reliability. A Pearson Correlation Coefficient was calculated from test/retest scores and found to be .86. Ten first grade students were selected for the study. They were given the pretest to check their present time telling skills. Of the ten students, eight were eligible for the study. Three students were used for the first field test. Two were age six and one was age five.

Each student went through the program individually. The length of instruction, examples and practice problems were matched closely to the paper and pencil version of the time telling program. The students progressed through the instructional section, examples, practice problems and quizzes at their own pace. Each student received a paper and pencil activity related to the lessons following their work with the videotape. During the time students were working through the videotape program, one researcher controlled the equipment while another worked with the student and kept a report of the responses they made throughout the lesson. Each of the two lessons were presented on separate days.

It was found that giving feedback in the form of correct answers using only a video cue with no audio cue was adequate. The students easily understood if they had answered correctly. The method utilized for presenting instruction, examples, and practice problems also seemed effective; however, the length of the lessons seemed to be too long. The students were getting

bored, and their attention would wander. They didn't seem to need as many questions with an audio cue. They seemed to understand what was to be done and acted impatient when waiting for the audio cues and often responded long before audio cues were completed.

Based on the results of the first videotape field test, changes were made in the way material on the tape was presented to the students. Both lessons were shortened. In Lesson One, the practice examples with audio remained the same, and the practice examples without audio were cut in half. The quiz remained the same. In Lesson Two, instruction was limited to just one example. Practice examples without audio (a short section anyway) remained the same as did the quiz.

Field Test Version 2.

Of the ten students originally selected for the study, eight were eligible for the study. Three students were used for the first field test. Of the remaining five students, three were used for the second field test. Two were age six and one was age five. The students progressed through the instruction section, examples, practice examples, and quiz at their own pace. Each student received a paper and pencil activity related to the lessons following their work with the videotape. During the time students were working through the program, one researcher controlled the equipment while another worked with the students and kept a record of the responses they made throughout the lesson. The two lessons were presented on separate days.

Both Lessons 1 and 2 were improved by reducing their length. The students were not getting bored, and remained attentive throughout the entire session. They did not get impatient or fidgety. The student's responses on an average were much better than those recorded during the first field test. Fewer errors were made during this second field test. The video feedback for each question was also effective with this version. There was no hesitation as students moved from verbal instruction on the tape to sections without audio cues. Students also moved easily from work on the videotape to the paper and pencil activity.

Results from the second videotape field test helped substantiate the findings from the first field test. The shorter lessons were more effective. Consequently, the lessons on the videodisc were shorter than the lessons in the paper and pencil time telling program. The difference in the medium of presentation was definitely an important factor. Students were able to grasp the concept more quickly with less drill and practice using videotape than with the paper and pencil version.

Providing correct answer feedback visually without accompanying audio cues proved successful in both field test versions, and helped save space on the videodisc. Providing practice examples without audio cues also proved successful and also saved space on the videodisc. The ideas tested in the videotape version were applied in the development of the final videodisc program.

Summative Field Tests

Teacher Net System Field Test

Students from two classrooms participated in the study investigating the effectiveness of the Teacher Net system. The first classroom consisted of first graders from the Edith Bowen Elementary School. The 27 students in this classroom were divided into an experimental group and a control group. Students were selected for the experimental group by determining if they could count by five which is a prerequisite to the time telling program. Eleven of the 27 students could count by five, and were therefore put in the experimental group. The remaining 16 students were in the control group and did not receive the time telling instruction.

The second classroom was a resource room at the Lincoln Elementary School. All students in the resource room were classified as Learning Disabled. Tests were given to determine which students could count by five, but did not have time telling skills. Nine students fit these criteria and were put in a group to receive the time telling instruction from the Teacher Net system.

In both classrooms the Teacher Net system was set up, but divided from the rest of the classroom with movable dividers. Student desks were arranged in front of the monitor. An individual keypad was placed on each student's desk.

Once the teacher initiated the system, the teacher was free to monitor the progress of the students on the computer monitor, to prompt the students when they didn't respond, and

to give individual assistance when a student was having difficulty.

The time telling skills test was given immediately before the time telling instruction began and immediately after the end of the instruction. The instruction in the regular education classroom required 9 days to complete. The students in the resource room also required 9 days to complete the program. The results of the field test and data analysis are contained in the Results Section.

Level I Fieldtest

The Level I Field Tests were conducted in three first grade classrooms at the North Park School. As with the Teacher Net Field Tests, the students in each classroom were tested to see if they could count by five. All students in each of the classrooms could count by five, and therefore, all students from each classroom were included in the Level I instruction.

The first teacher (Classroom 1) at North Park used the videodisc which was used in the Teacher Net field test. The teachers in Classrooms 2 and 3 used a revised version of the videodisc. The revised version consisted of seven lessons instead of nine. The videodisc used in the Teacher Net and Classroom 1 field test was an RLV videodisc. The videodisc used in Classrooms 2 and 3 was a Replicated videodisc.

Results and Discussion

This section is organized by the three main objectives. As noted earlier, the first two objectives were contained in the proposal. The third objective was added by project staff.

Objective 1

An instructional program which teaches time telling skills using a videotape/Teacher Net system will be developed.

Because the interactive videotape system would not function properly, it could not be used with the Teacher Net system. It was decided to produce only the first two lessons on videotape and field test these lessons with a small number of students while controlling the videotape player manually. Two field tests were conducted with three different students for each field test. Based on the field test results, major revisions were made, the scripts for all nine lessons were completed, and an RLV videodisc was produced for additional field testing.

Objective 2

The program developed in Objective 1 will be field tested. Based upon the results of the field test, a revised program will be completed and a videodisc pressed.

The program resulting from the attainment of Objective 1 was transferred to an RLV videodisc. As noted in an earlier section, an RLV videodisc is of lesser quality than a replicated videodisc, but is much less expensive and is sufficient for field testing. The RLV videodisc was used in both Networking field tests and in one of the Level I field tests.

Table 1 shows pretest and posttest mean scores for each of the six groups. The scores used to calculate the means were percent correct scores. Percent correct was used because the test used in the Level I classrooms was a shorter version of the test used in the Teacher Net field test.

Table 1. Means, Standard Deviations, Gain Scores, and Correlation Coefficients for Each Group for Both Teacher Net and Level I Systems.

Group	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Gain Mean	r
Teacher Net							
Regular Education Experimental	11	12.7	18.4	52.3	30.7	39.6	.41
Regular Education Control	16	12.5	14.7	17.6	13.3	5.1	.66
Learning Disabled	9	26.6	15.5	61.5	24.3	34.9	.50
Level 1							
Classroom 1	27	35.4	16.2	71.7	23.3	36.2	.32
Classroom 2	26	36.5	27.9	76.6	22.4	39.4	.46
Classroom 3	24	44.6	30.4	87.9	19.2	41.9	.44
Total	113	31.5	25.2	65.6	31.0	33.9	.44

As can be seen from the mean gain scores in Table 1, the two groups using the Teacher Net system made substantial gains, while the students in the control group showed little or no gain between the pre and post tests. The correlation coefficient of .66 for the control group shows a moderately reliable test/retest situation. The effect size of the gain calculated by dividing the mean gain score by the pooled

standard deviation of the pretest, for the regular education group was 2.80. The effect size for the group of learning disabled students was 2.47.

There were 28 points possible in the test. In the regular education group, four of the eleven students demonstrated mastery of the skills with a score of 80 percent or better on the posttest. In the group of Learning Disabled (LD) students, three of the nine students demonstrated mastery at the 80 percent level.

An analysis of variance with repeated measures was run to determine if there were statistically significant differences between the groups and between the pre and post tests. The results of the analysis are contained in Table 2.

Table 2. Analysis of Variance with Repeated Measures Comparing Differences Between Groups and Test Administrations with the Teacher Net System.

Source of Variation	DF	MS	F	Prob.
Between Subjects				
Within Cells	18	59.27		
Group	1	104.08	1.76	.20
Within Subjects				
Within Cells	18	25.68		
Tests	1	1,077.87	41.97	.00
Tests x Group	1	4.27	.17	.69

There was no statistically significant differences between the group mean scores across both tests. The mean scores between the pretest and the posttest for both groups was statistically significant at less than the point .01 level. The tests by group interaction was not statistically significant which shows that the rate of gain was essentially

the same for both groups. To test the accuracy of the repeated measures analysis, an analysis of variance on the gain scores was run. This analysis resulted in exactly the same probablity estimate for differences between the two mean gain scores.

Objective 3

Develop videodisc as both Level I and Level III and compare Levels for effectiveness.

As was noted earlier, the two Teacher Net Groups (Groups 1 and 3) and the first Level I classroom (Group 4) used the RLV videodisc version of the program. Level I Classrooms 2 and 3 (Groups 4 and 5) used a revised version of the program which was contained on the final "Replicated" videodisc. An analysis of variance with repeated measures was run to determine mean score differences between Groups 1, 2, and 3 and the pre and post tests. The results of this analysis are contained in Table 3.

Table 3. Analysis of Variance with Repeated Measures Between the Three Treatment Groups with Percent Correct Scores for Pretest and Posttest

Source of Variation	DF	MS	F	Prob.
Between Subjects				
Within Cell	44	620.02		
Group	2	3,565.80	5.75	.006
Within Subjects				
Within Cells	44	298.57		
Tests	1	25,665.34	85.96	.000
Tests X Group	2	31.75	.11	.899

As can be seen from Table 3, there was a statistically significant difference between the groups across both tests; however, the tests by group interaction indicates that the rate of gain was essentially the same for all three groups. An examination of the means in Table 1 indicates the differences on the posttest scores are associated with differences in the pretest scores. An analysis of covariance using the pretest as a covariant was also run. It resulted in the same conclusion.

There was some difference in the ages of the students in each group, but the correlation between age and the other variables was very low. For instance, the correlation between age and the posttest was .2, and therefore, age was not used as a covariate.

It is interesting to note that the three groups took approximately the same amount of time to complete the program, and that the students classified as learning disabled did nearly as well as the regular students in the other classrooms. The teacher in the resource room felt that the students did well with the program because the program was broken into small steps, provided consistent feedback, and allowed her to work individually with students having problems.

The classrooms in which the Level I field tests were conducted contained no students that had been classified for special education. Because of school policy, students would not have been classified for special education services until the beginning of the following year. The teachers did indicate, however, that there were a number of low functioning students in each of the classrooms. In order to determine if

the program differentially affected low achieving students, achievement scores were collected for each student and the students were classified as low, medium, and high achieving. Those students classified as medium achieving had scores that were plus or minus one standard deviation from the mean. Low achieving students were one standard deviation below the achievement mean, and high achieving students were one standard deviation above the achievement mean score. In addition to the pretest and posttest, a maintenance test was given in each of the three classrooms. The time between the posttest and the maintenance test was 18 weeks for Classroom 1, three weeks for Classroom 2, and three weeks for Classroom 3. The discrepancy in time for the maintenance testing was due to not making the decision to do maintenance testing until the second classroom had completed the field testing. The mean scores in Table 4 are derived from percent correct scores. As can be seen, the mean percent correct for Classroom 1 on the maintenance test is somewhat lower than the other two classes. This was probably due to the extra length of time between the posttest and maintenance testing.

Table 4. Means, Standard Deviations, Gain Scores for Level I Groups, catagorized by Math Achievement Rank

Group/Rank	N	Pretest		PostTest		Maintenance	
		Mean	SD	Mean	SD	Mean	SD
Classroom 1	27	35.4	16.2	71.7	23.3	62.6	30.1
Low	5	27.1	16.3	44.3	29.6	41.4	32.5
Medium	16	39.3	17.7	76.3	16.0	68.1	26.4
High	6	32.1	8.7	82.1	20.0	66.7	34.3
Classroom 2	25	37.4	28.1	75.9	22.7	73.7	27.3
Low	6	31.0	30.9	78.6	13.6	85.7	16.3
Medium	15	39.5	27.9	72.4	27.0	67.1	30.4
High	4	39.3	31.7	83.9	17.9	80.4	25.0
Classroom 3	24	44.6	30.4	87.9	19.2	84.8	25.2
Low	4	37.5	23.6	80.4	20.5	71.4	38.7
Medium	16	44.2	31.4	89.0	21.4	86.6	23.5
High	4	53.6	37.6	91.1	6.8	92.9	12.4
Total	76	39.0	25.4	78.1	22.7	73.3	28.8

Table 5 shows a two-way Analysis of Variance with repeated measures between the two Level I classrooms which used the final replicated videodisc and three levels of achievement. A two-way analysis was used in this case in order to examine the interactions between group and rank.

Table 5. Two-way Analysis of Variance with Repeated Measures Between Level I Classroom 2 and 3 (Groups 4 and 5) and Achievement Rank Using Percent Correct Scores for the Pretest and Posttest.

Source of Variation	DF	MS	F	Prob
Between Subjects				
Within Cells	41	1,000.80		
Group	1	1,268.76	1.27	.267
Rank	2	451.89	.45	.640
Group x Rank	2	87.20	.09	.917
Within Subjects				
Within Cells	41	395.88		
Tests	1	28,946.24	73.12	.000
Group by Tests	1	.22	.00	.981
Rank by Tests	2	120.76	.31	.739
Group x Rank	2	200.89	.51	.606

Significant differences were found only between the pre and posttests. An examination of the mean scores in Table 4 indicates that the gain was essentially the same for both groups of students.

An analysis of variance with repeated measures was run to determine differences between the posttest and the maintenance test. The results of this analysis is contained in Table 6.

Table 6. Two-way Analysis of Variance with Repeated Measures Between Level I Classroom 2 and 3 (Groups 4 and 5) and Achievement Rank Using Percent Correct Scores for the Posstest and Maintenance Test.

Source of Variation	DF	MS	F	Prob
Between Subjects				
Within Cells	40	1,027.60		
Group	1	748.47	.73	.398
Rank	2	288.25	.28	.757
Group x Rank	2	1,010.25	.98	.383
Within Subjects				
Within Cells	40	70.65		
Tests	1	8.92	.13	.724
Group by Tests	1	32.41	.46	.502
Rank by Tests	2	.09	.00	.999
Group x Rank	2	167.82	2.38	.106

No statistically significant differences were found as shown in Table 6. As can be seen by the mean scores in Table 4, the students lost very little of their time telling skills between the posttest and the maintenance test.

Teacher Attitudes

The teachers who participated in the Level One field test were generally very pleased with the program. They were quite positive about the approach to time telling (the way the concepts were introduced and presented). They were very excited about being able to use the videodisc program, especially as a Level One configuration since they were integrally involved in the instruction. They liked being able to control program presentation to fit the needs of their class. They liked being able to walk around the class during the presentation in order to assist students with problems. They felt the videodisc format maintained student attention well and were pleased with the rate

at which their students learned the concepts. They liked the option of being able to pause the program at any time in order to provide additional information or explanation depending on the needs of their students. Although, the teachers provided suggestions for improvement in various areas of the program, their overall attitude about the program and the use of the technology was very positive.

Dissertation Study

The dissertation study involved the investigation of the effectiveness of three levels of informative feedback on the acquisition and retention of telling time skills. The Time Telling RLV videodisc and Teacher Net system developed by project staff were used in the study.

Three groups of 20 students each participated in the study. The three groups represented three different schedules of feedback. The material was presented to the students via the Teacher Net system. Each student used an individual response pad, which was connected to the microcomputer, to indicate their responses to questions posed by the system.

The Time Telling Program was divided into nine lessons. The students received information feedback on the practice section of each lesson. Feedback was presented: (a) immediately following each response, (b) at the end of the entire lesson, or (c) 24 hours following the lesson. The system also administered a quiz the day following lesson completion to see if each student met the lesson criteria of 70%. The lesson was repeated until the student could meet the preset level of competency.

The day after the nine lessons had been completed a paper and pencil test was administered. This test was intended to determine at what level the different feedback groups acquired the skill of telling time. Another paper and pencil test was administered three weeks later. This test was to examine the retention levels of the three groups.

The group means from the acquisition and retention tests were compared using analysis of variance. No statistically significant differences were found between the three groups with respect to feedback level on acquisition and/or retention.

Conclusions

The first two objectives were to develop a videodisc that teaches time telling skills and to field the videodisc using the Teacher Net system. The videodisc and the Teacher Net systems were developed, and field tests were conducted to determine the effectiveness of teaching time telling skills with the Teacher Net system and to determine if there were differences in effectiveness when the system was used by regular education students and by special education students. The results of the field testing indicated that the system was effective in teaching time telling skills, but that there was no statistically or practically significant differences between the regular education and the special education students. An additional analysis showed that a regular education control group who did not participate in the time telling instruction showed little or no gain between the pre and post tests. There was a substantial difference between the posttest mean scores of the control group and the other two Teacher Net groups indicating that the gain in time telling skills was due to the Teacher Net System.

Even though the Teacher Net system effectively taught time telling skills to both groups, it had problems. The Teacher Net hardware was reliable and provided an effective means for individual responses to group instruction; however, the first and second graders were continually playing with their own keyboards, their neighbor's keyboards, and the wires that connected the keyboards to the computer system. It required

considerable teacher intervention to keep these young children on task. Project staff concluded that the Teacher Net hardware is effective, but it is not an efficient way to teach with young children. As evidenced by the Carnine study (1986), we know that a similar Teacher Net system works well with high school students. We suspect that the system would also work well with fifth and sixth graders, but as a result of this study, we would be hesitant to use the system with students below the fifth grade level.

The Level I system also effectively taught time telling skills and did so with much simpler equipment. The Level I system requires a teacher to operate the system, monitor student responses, and provide assistance to individual students. It was intended that the Teacher Net system would operate without teacher intervention, but with the first and second graders this was not the case. Both systems required the presence of a teacher during an entire lesson.

There was no statistical or practical difference on the attainment of time telling skills between the Teacher Net system and the Level I system. Since the Level I system is much simpler and considerably less expensive, it is considered the system of choice. The results of the analysis involving the two Level I classrooms which used the final "replicated" videodisc was as effective with low achieving students as it was with medium and high achieving students. The results of the maintenance testing with these students showed that they maintained the skills over an 18 day period, and that low achieving students maintained the

time telling skills as well as the medium and high achieving students.

Because of its simplicity, we feel that the Level I system is the preferable approach to providing videodisc based group instruction. With the Teacher Net system, the system provides a prescription for remediation. With the Level I system, the teacher provides the prescription for remediation. Since both systems require teacher intervention with this age group, the remediation provided by the teacher is desirable to that provided by the Teacher Net system.

Dissemination

A description of the system was presented at the National Conference of the Association of Behavior Analysis in Nashville, TN, in March of 1985 (Serna, 1985). A paper describing the results of the first videodisc field test involving the regular education experimental and control students was presented at the conference of the Council for Exceptional Children, New Orleans, LA, April, 1986 (Serna and Thorkildsen, 1986). A description of the results of the Level I field tests was presented at the Utah State Council for Exceptional Children meeting in Park City, UT, 1987 (Hansen, 1987). The results of all of the summative field testing will be presented at the Technology and Media Division of the Council for Exceptional Children Conference in Baltimore in January, 1985 (Thorkildsen, 1988). The dissertation study is described in a dissertation (Pitcher, 1986) and is available from Dissertation Abstracts International.

The videodisc time telling program was used in a subsequent research project that investigated the effectiveness of different types and different schedules of feedback. This project used the videodisc in a Level III application. The results of this project will be presented at the Technology and Media Division of the Council for Exceptional Children Conference in Baltimore, MD, 1988 (Thorkildsen and Reid, 1988). The videodisc is currently being used as a Level I program in the Logan Utah School District. Additional copies of the videodisc will be made and distributed through the Outreach and

Development Division of the Developmental Center for Handicapped Persons.

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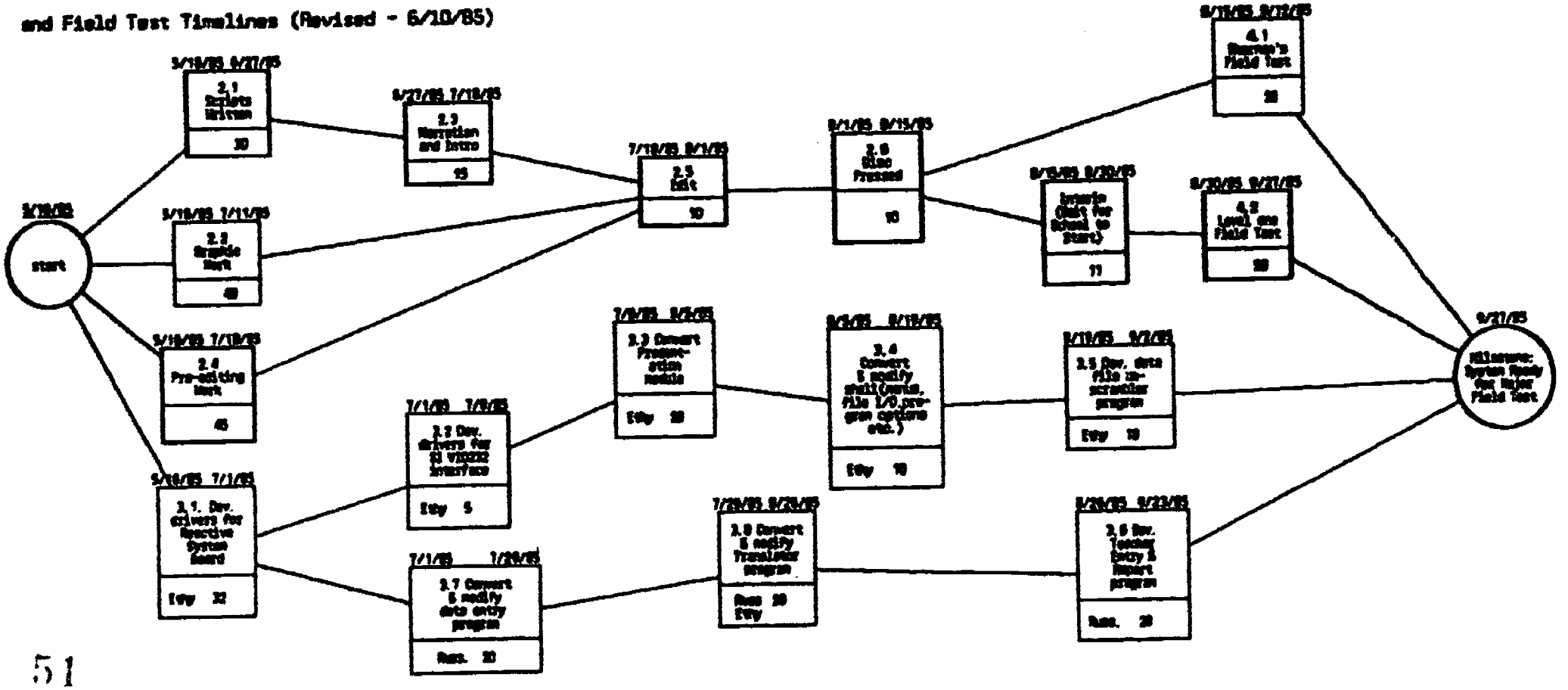
APPENDIX A

Management System Time Lines

Tchr/Net Production, Software Development

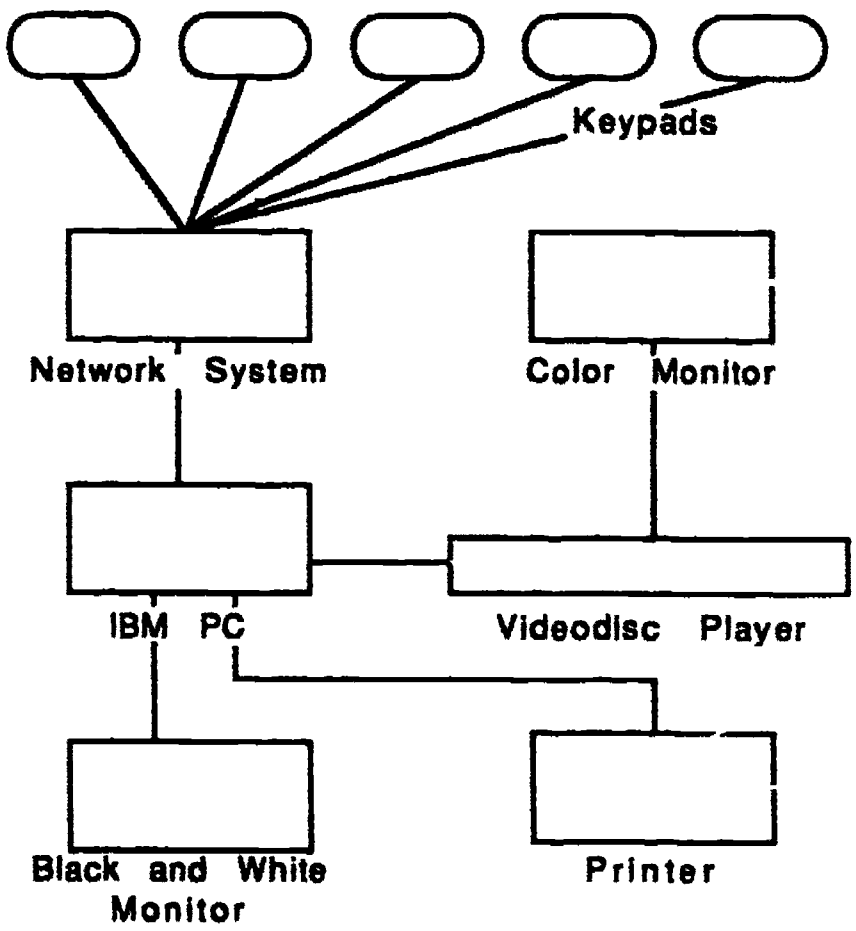
and Field Test Timelines (Revised - 6/10/85)



APPENDIX B

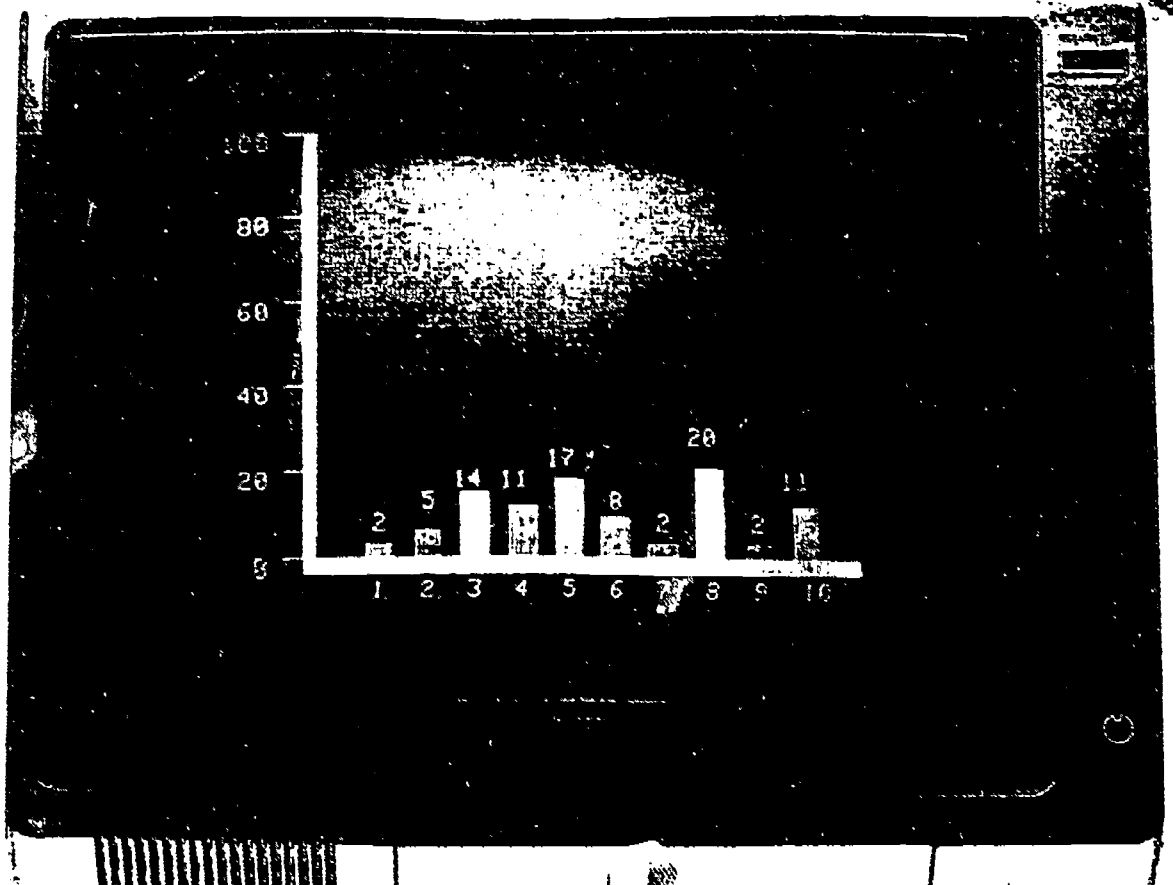
Teacher Net Hardware

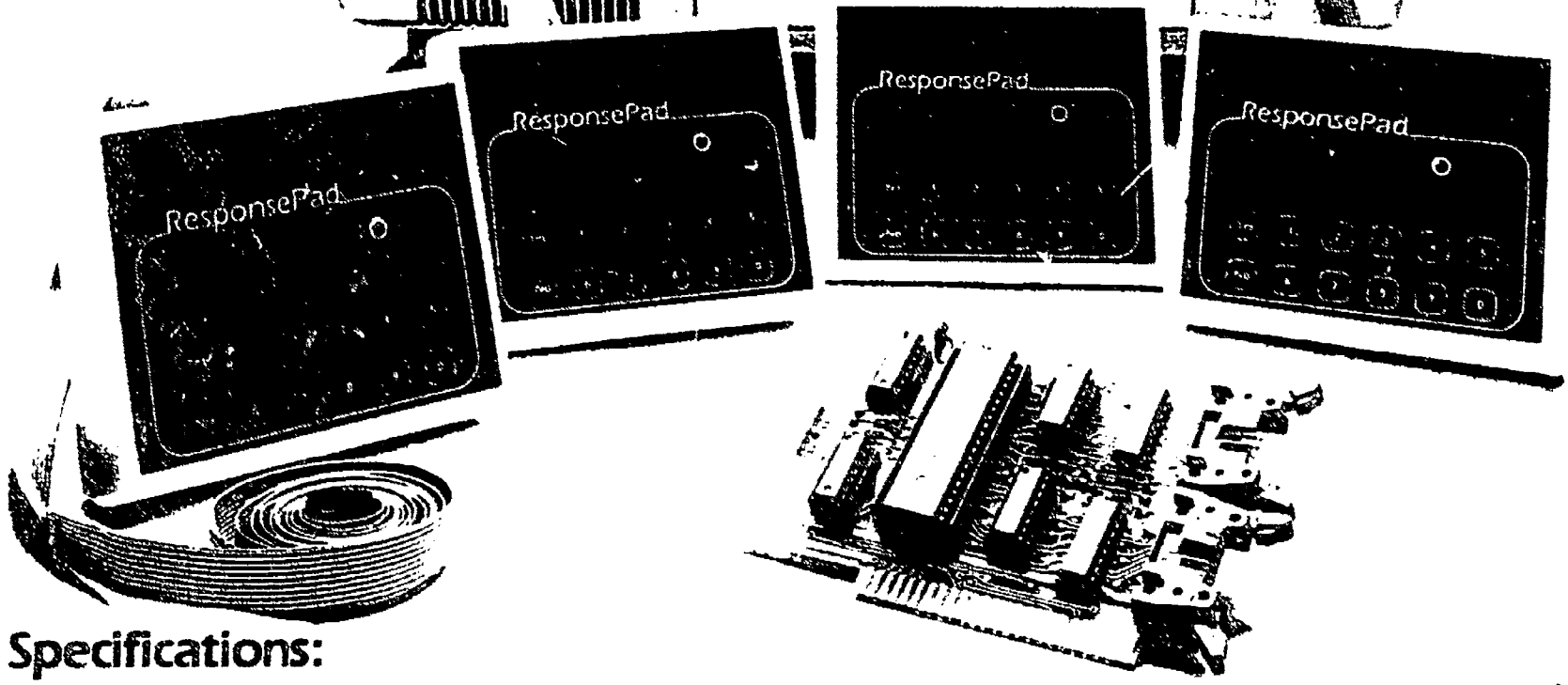
TEACHER NET SYSTEM



APPENDIX C

Reactive Systems Network System





Specifications:

A basic system consists of an interface card which plugs into the computer, fourteen student Response Pads, one instructor control pad, cabling, software and manual. Additional Response Pads or special cabling can be ordered.

Interface card -- Apple II+, Apple IIe, Franklin, Bell & Howell, etc.
- Interface fits in slot 2.
- Response Pad capacity — 30 students, 2 instructor controls.

Interface card — IBM-PC, Compaq, etc.
- Interface fits in any slot
- Response Pad capacity -- 60 students, 4 instructor controls.

Response Pads
- Twelve-button response choices (0-9 and "yes" and "no")
- Momentary key switches mounted under protective label
- LED indicator light extinguishes when computer picks up response
- Each Pad has a unique identity in the system.

Cabling
- Ten-conductor flat ribbon cabling. One "home run" to computer for each fifteen students
- Locking connectors on "home run" normally four feet apart. Response Pads normally have five feet of cable leading to the floor.
- Special cable lengths or specially-protected cable can be ordered through dealers.
- Response Pads can be up to 100 feet away from computer.

Software — the following software is available
- Response interval — permits students to respond to multiple choice questions during a teacher-specified interval and displays results in a color bar chart. One version of the program permits students to change their answers within the time interval, one version does not allow it. Questions are presented outside the system (verbally, blackboard, overhead transparency, etc.)
- Student Test — System solicits response from students, solicits correct answer from the teacher, evaluates and grades each student response and stores results for subsequent printout. If the teacher has registered a class roster on the system, the report will be printed by student name. Otherwise it is shown by station number. Reports can be generated student-by-student or quiz item-by-item.
- Decision-making -- The program solicits response and indicates on the video screen how many votes have been cast. When the group's leader stops the polling se[illegible] the system displays the response an[illegible] preferred mean[illegible]

Reactive Systems, inc.

PRICE LIST

Group Response System - Apple family

		Price
A101	Interface card, 15 Response Pads, cabling, software & manual	$1,400
A102	Additional Response Pads (capacity of 30)	$65

Group Response System - IBM PC family

I101	Interface card, 15 Response Pads, cabling, software & manual	$1,800
I102	Additional Response Pads (capacity of 60)	$65

Dealer information can be supplied by contacting Reactive Systems, Inc.

40 North Van Brunt St., Englewood, N.J. 07631 • (201) 568-0446 • Telex: 759688 • ELN: 62532440

APPENDIX D

Software Description and File Layout

Student Header

Name - student's name

Id number - identification number of student

Keypad number - keypad number associated with student, once a student is assigned to an input station, that student will always use the same input station.

Student Session

Lesson number - Lession number associated with session

Session number - sequential count of sessions presented whether to a group or individual.

Last question presented - The last questions presented in group work

Number of questions presented - The number of questions presented for the associated session.

Percentage of correct answers - The percentage of correct answers for the associated session.

Session type - Indicates whether the session was group or individual.

Worksheet assignment - coded: 0 for none, 1 for ...

Date - the associated date of the session.

The Student Session file will contain information for each student's session. Each student will have his/her own session file.

(tnetd1.doc,8/01/85,pc-2)

Student Response

Keypad number

Response

Correct answer

Session number

Question number

The student response file will be a temporary file that will contain all student responses from a group. At the end of a session, a program will take the date from the group's response file and create individual data files for each student for the session. (Refered to as the response analysis program.) The presciption will then be derived from the individual file.

Telling Time IPS Documentation (6/11/86)

The IPS authoring system is written in Aztec C. It consists of a number of programs chained together through the use of the **execlp()** function. These programs and their linking commands are as follows:

IPS --shows startup logo and prompts the user for the current date, then calls IPSMAIN.
ln ips.o extra.lib c.lib s.lib g.lib

IPSMAIN --contains session startup, session presentation, and session wrap up.
ln ipsmain.o extra.lib c.lib s.lib g.lib response.o

IPSSETUP--sets up student files on the date diskette.
ln ipssetup.o extra.lib c.lib s.lib g.lib

IPSREP --shows the report menu and calls the reports accordingly.
ln ipsrep.o extra.lib c.lib s.lib g.lib

IPSHMWRK--a report which shows the results of the test requested, for all students on the data diskette, and assigns homework according to each student's performance.
ln ipshmwrk.o extra.lib c.lib s.lib g.lib

IPSDMP --lists all the responses from each student by question (event) number and keypad.
ln ipsdmp.o extra.lib c.lib s.lib g.lib

The main program in the system, IPSMAIN, is broken into modules complied together through use of the **include** directive to make for slightly more managable source files. these modules are as follows:

IPSMAIN.C -- contains the main menu (1: start a session, 2: run reports, 3: set up a student diskette) and calls the programs for options 2 and 3. also contains some general purpose functions.

IPSDEC.C -- contains the declaration part for IPSMAIN with the variables loosely organized by purpose.

IPSPQBGN.C -- starts up a session by setting various defaults (lesson number, percentage of responses in before timing out, length of time for timeout, run whole lesson or test alone, run for a group or an individual, start at the beginning of the lesson or somewhere in the middle), then prompts the user to indicate which students are on the system and ready for a lesson.

IPSPQ.C -- contains the actual session presentation program and wraps up the files at the end of the session.

In addition to the functions provided by the regular Aztec libraries, the following functions used by the IPS programs are included in **extra.lib**. (see the file **extra.doc** for more information.)

readrec()	read a record from an indicated byte location.
writerec()	write a record to an indicated byte location.
getkey()	read a single character from the keyboard.
in_set()	check if first argument is equal to any of the subsequent arguments.

Disk File IO

Disk file I/O works in the following manner:

- All disk files are set up as raw data files.
- A file is associated with a particular structure which is **unioned** with a character array the same size as the structure. If there is a header record for this file, the header record is also included in the **union**. All parts of the **union** are the same size.
- The buffer part of a **union** is called **.buf** and the structure part is **.rec**. If there is a header record, it is called **.head**.
- The size of each record is declared as a constant and given a label to avoid having to change every file i/o command associated with that file if a change is made in the record size.
- The position of a record is given as its byte location or as a multiple of its size (i.e. the record number).

Debugging

Debugging the the parameter data is accomplished by means of debugging commands embedded in the program. These are activated by setting the variable **DEBUG** equal to **TRUE** (in **pques.c**, function **initvar**) and re-compiling. These statements list the parameter information and also show some of the program flow (for example, there is message stating that the program is waiting for a response).

There are also some statements left in the source code but deleted from the object code by means of comment marks which were used again and again in debugging the orginal program and its numerous revisions. These have been left in for possible future use.

History

The program **ipsmain** is a translation of the old Apple II Pascal program. The startup process, however, was completely re-written and the files altered slightly (in some cases considerably). The presentation process (the function **pques** and its subordinates) was left essentially the same, at least in in results, if not entirely in the logic. Some features from the Apple version which were not needed for this application were included only in a rudimentry form. Other things were included and when it was found the weren't need, simply left in, dangling. For example, the variable **BOOLVAR** was used in the old Apple system to indicate various conditions based on whether or not its various bits were set. This is now all taken care of with the single boolean **contp**. However, **BOOLVAR** has been left in the code in case it is needed in the future.

The major revisions after the first version was up and running were:

1] Added the ability to show reinforcers from the videodisc when 100% of the students answer correctly.

2] Added the ability to exit a session at any time by means of pressing the key 'x', without loosing any data gathered up to that point, and to start a lesson anywhere in the middle by choosing the option to do so from the SESSION DEFAULTS screen, and typing in the desired question (event) number.

Package Control Data

PARAMETER DESCRIPTION

Parameter 1

Value	Description
0	+ show instruction block + look for a response + value of parameter 2 will indicate whether or not specific subblocks are used, and how to treat them. + value of parameter 3 gives the maximum number of correct or incorrect responses in a row (depending on whther correct or incorrect responses are counted) to allow before jumping to a predesignated question number.
1	+ ignore instruction block + look for a response + value of paramater 2 will indicate whether or not specific subblocks are used, and how to treat them. + value of parameter 3 gives the maximum number of correct or incorrect responses in a row (depending on whether correct or incorrect responses are counted) to allow before jumping to a predesignated question number.
2	+ show instruction block + don't look for a response + use instruction block goto
3	+ show instruction block (test introduction) + value of parameter 2 gives the number of test items + value of parameter 3 gives the minimum number of correct responses to pass the test.
4	+ show instruction block + signal teacher + don't look for a response + use incorrect 1 block's goto
5	+ show instruction block (menu) + look for response but don't record it in the response file

6
+ show instruction block (introduction to a non-test unit)
+ don't wait for a response
+ store incorrect 1 block's goto for the question to jump to if the maximum number of correct or incorrect responses is reached
+ use instruction block's goto
+ parameter 3 gives maximum correct or incorrect, default is 3

8
+ ignore instruction block
+ end session here
+ don't look for a response

9
+ ignore instruction block
+ package ends here
+ don't look for a response

SUBBLOCK DESCRIPTION

Type	Description
0	+ play video segment
1	+ show text screen
2	+ no video or text
3	+ the videodisk needs to be turned over, or the video tape changed
4	+ play video segment + signal teacher

EXPLANATION OF USER DEFINED FIELDS

Question Header

Question number -- identifies the 'question' which may be a menu, and introduction, explanation, or question, among other things. It takes the form of:

aa/bb/cc/dd

where aa is a unit number, bb is a sequence number, cc is the 'fudge field', and dd indicates how the question is to handled: 00 indicates a 'generic' number, 09 indicates a test question.

Parameters -- (described in parameter descriptions above)

correct/incorrect answer -- a single character response is allowed. There are up to one correct and 6 incorrect answers possible. If no characters are entered in any of the answer fields, any response will be accepted but not recorded. If any characters are entered in the answer fields, only those responses will be accepted. In the case of systems using the GRS (Group Reactive System), however, all responses will be excepted, but any response other than a 'Y', 'N', 'A', 'B', 'C', or 'D' will be recorded as a '?.'

Sub-block Record

Sub-block -- sub-block name: I-instruction, C-correct, 1-incorrect 1, 2-incorrect 2, 3-incorrect 3, 4-incorrect 4, 5-incorrect 5, 6-incorrect 6.

sequence -- sub-block of the same name can be strung together rather than creating several question to present a string of video or text, or a conbination of the two, which is not interrupted by responses.

type -- (described under Sub-block Description above)

boolean variables -- video start -> turn video on at the beginning of the segment, video end -> turn video on at the end of the segment, audio 1 -> turn on audio track 1 at the start of the segment, audio 2 -> turn on audio track 2 at start of the segment. freeze frame -> freeze the end of the video segment. (used in conjunction with freeze value below)

freeze value -- the length of time (in seconds) that the video is to be 'frozen' on the screen before continuing with the presentation.

gotoq -- the next question to present if this sub-block is chosen (depending on the response), or required(if determined by the parameters).

Documentation for the Group Reactive System assembly interface

June 2, 1986

The GRS interface board allows up to 16 keypads on 4 ports. It is linked to the IPS program by means of an assembly program. The GRS board can fit into any available slot and the long cable which connects all the keypads to the board can also fit into any of the available connectors. The keypads can be attached to the long cable in any order.

Changes to link with C

The original assembly program was designed to be called by a BASIC program and was called VOTER06. The following changes had to be made to link this program to the C version of IPS:

- The name was changed to **responses** to coincide with IPS terminology.

- All global variables had to end with a _ (e.g. **responses_**) since Aztec C appends a _ to all its variables and can't recognize them without it.

- **dseg** and **cseg** became **dataseg** and **codeseg**, due to differences in MASM (the assembler used for the orginal program) and the Aztec assembler.

- There was no need for the **org** directives. Apparently Aztec C would rather take care of locating code and data itself.

- Aztec C cleans up the stack itself upon exiting, so the commands to clear the parameters off the stack had to be removed.

- Aztec C takes care of the stack pointer (**sp**) by storing it in **bp**, so all assembly procedures must begin with:

```
push bp      ;save bp
mov  bp,sp   ;save sp in an accessable place
             ;  (it will be used to retreive parameters)
```

and must end with:

```
mov  sp,bp   ;restore sp
pop  bp      ;restore bp
```

- The parameters are pushed on the stack in order of appearance and therefore are retrieved in order using **bp**. **bp+4** gives the location for the first parameter.

Changes in capabilities

There were also changes made in the workings of the function itself:

- The ability to time out after a percentage of the responses are in (as determined by the parameters) was added. A beep can be sounded at the time the function goes into the timing loop by taking away the three comment symbols (;) below **final$call**.

- There is an additional parameter which provides a bit map for the active keypads (e.g. 130D = 10000010B would indicate keypads 15 and 1 are active).

- After a response has been read from a keypad the light is turned off by no longer accessing that keypad. The lights are turned on during the process of accessing the keypad. The light on the keypad will stay on until another keypad is accessed. This is what gives rise to the flickering light on active keypads which have not yet responded.

  NOTE: To avoid a lone light from being left on after exiting responses, it was necessary to turn on the light of the presumed non-existant keypad 0. If keypad 0 is needed for some reason, an alternative will have to be invented!

Calling procedure

To use **responses**, the calling program has to be linked to **response.o** along with any other libraries needed. The program is called in the following manner:

```
responses(pn%,mv%,rt%,mr%,tr%,km%);
```

where:

pn% is the port number, in this case 5
mv% is the maximum key value allowed determined by 15-n, in this case 3 allowing 15-3, that is, all 12 keys.
rt% gives the maximum response time to allow after the indicated minimum number of responses are in and before timing out. This is dependant on the number of active keypads (it takes less time to check on fewer keypads). To get **rt%** where **wait**=seconds:

rt% = wait * 15*(15/number of active keypads)

mr% gives the minimum responses to read before going into the timeout loop.
tr% maximum number of responses which can be read (number of active keypads).
km% bit map of active keypads.

Accessing the data

The variable **resp_map_ad** is a global variable created in **responses** which gives the beginning address of the "response map" where responses are stored by port and keypad number. Responses are stored as a number between 1 and 12, representing the key that was pressed. **resp_map_ad** is declared as an **extern int** in the calling program. The calling program can access the "response map" in the following way:

```
response_type[keypad]  =
     peekb((resp_map_ad+(offset*16+keypad)),respseg);
```

where **respseg** and **offset** are determined by:

```
offset = 6;
segread(segpntr);    /* segpntr will hold the address
                        of the  memory segments. */
respseg  = segpntr[2]  /* [2] contains the data segment
                          segment address (ds) */
```

Algorithm for responses

The general scheme of things in **responses** is as follows:

location		action
responses_	[1]	save altered registers
	[2]	get the parameters from the stack and initialize variables.
vote$loop	[3]	are the minimum number of responses in? no: goto [4], yes: goto [5]
	[4]	look for responses goto [3]
final$loop	[5]	are all responses in or timeout? no: goto [6], yes: goto [7]
not$all	[6]	look for responses goto [5]
start$disp	[7]	tally responses (not used for this application)
	[8]	restore registers and return

NOTE: the terms "response" and "vote" are used interchangably in the program comments.

subroutines

get$vote

Check all keypads for each port in sequence for a valid response. If there are any, store then in resp_map according to the port and keypad numbers. Non active keypads and those which have already responded will not be checked.

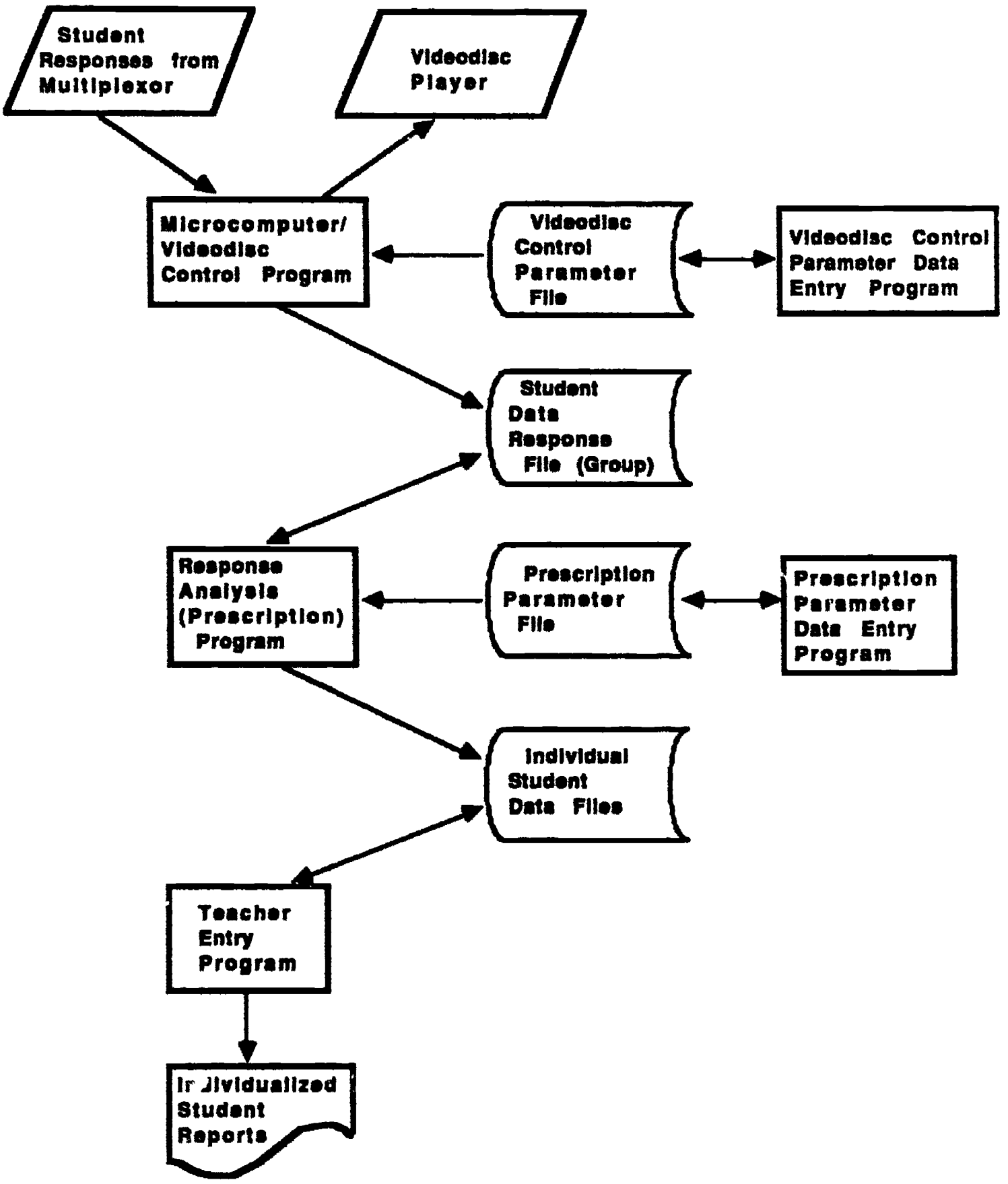
wait$n$ms

Provides a brief pause.

make$tallies

Tallies the responses by response (a number between 1 and 12). This feature is not used by this application.

Teacher Net Software - I/O Interaction



APPENDIX E

Time Telling Skills Test

TCH/NET LEVEL I PRETEST

CHILD'S NAME: _____ **DATE:** _____

AGE: _____ **M / F**

1. Letter Identification

A. Recognition - "Show me the letter _____"

B _____ A _____ C _____ D _____

B. Oral Naming - "What letter is this?"

D _____ B _____ A _____ C _____

2. Counting

A. By One's - "Can you count? Begin counting from 1 and I'll tell you when to stop (Stop anytime after they reach 12).

_____ Errors: _____

B. By Five's - "Can you count by fives? Start at zero and count by fives. I'll tell you when to stop (Stop anytime after they reach 60).

_____ Errors: _____

3. Telling Time

A. Analog - "Look at this clock. What time does it say?"

_____ correct out of 14.

B. Digital - "Look at this clock. Now look at the numbers below the clock. Which one shows what time the clock says?"

_____ correct out of 12.

TCH/NET LEVEL I PRETEST

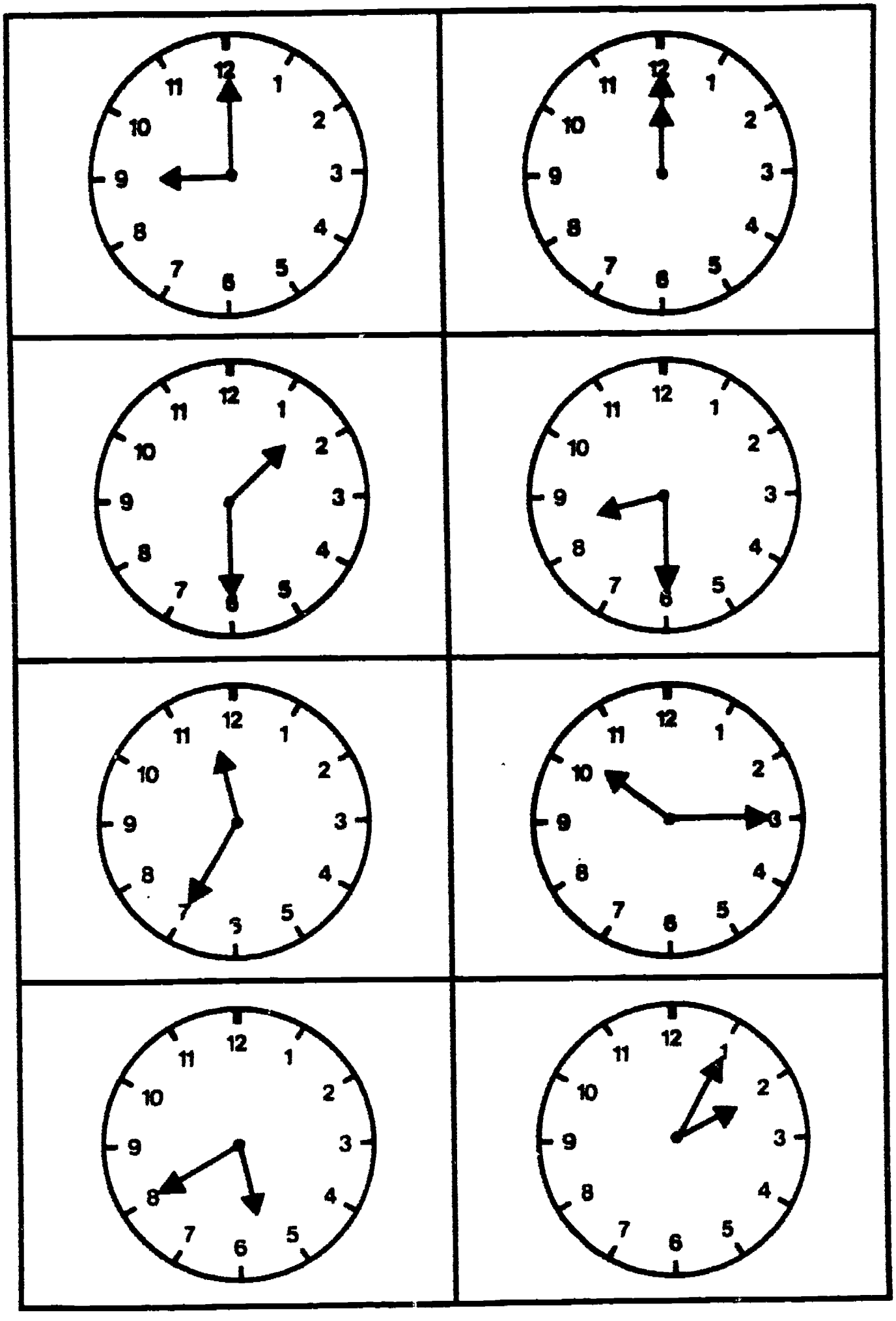
Scoresheet

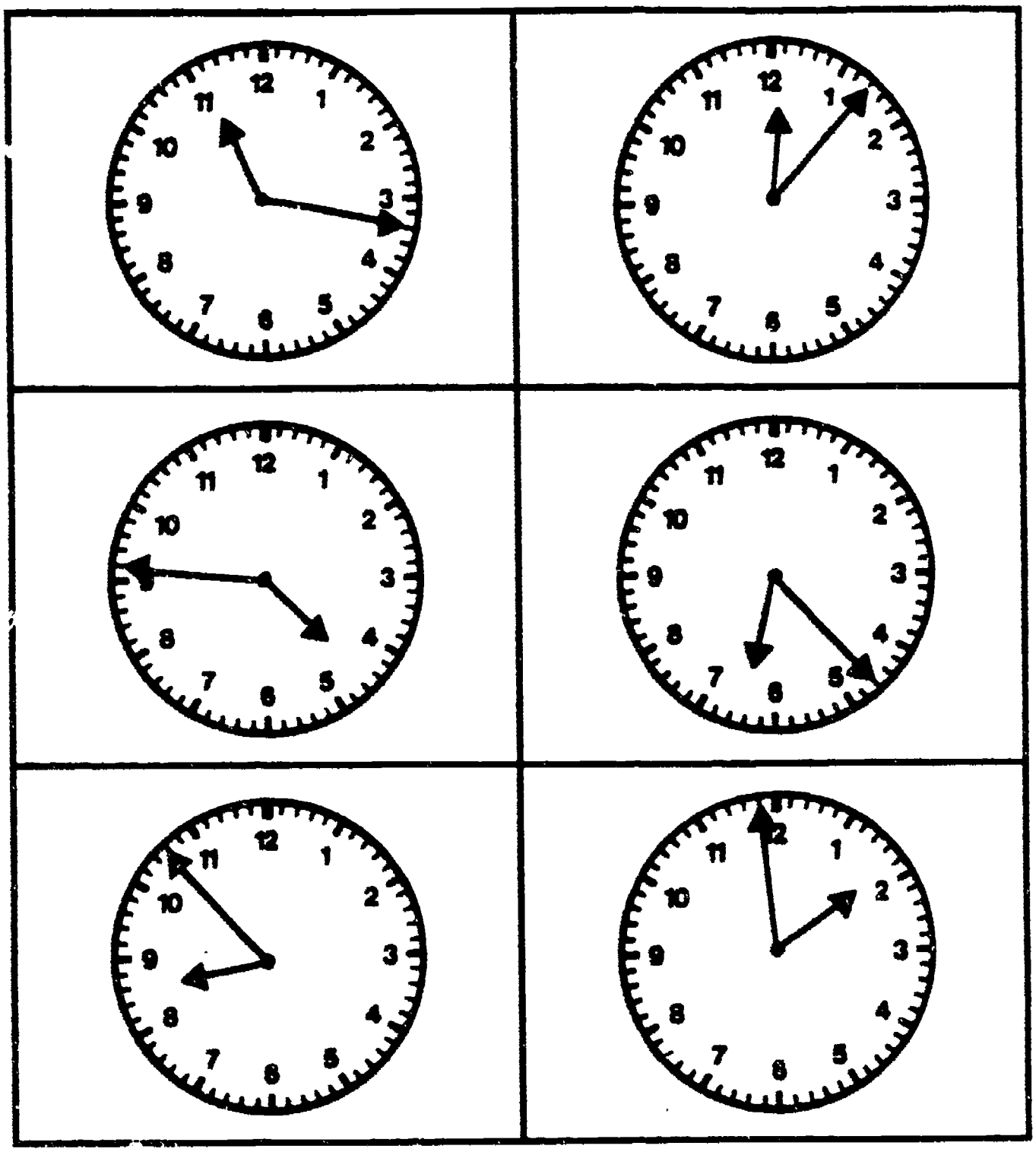
PAGE 1	
9:00	12:00
1:30	8:30
11:35	10:15
5:40	2:05

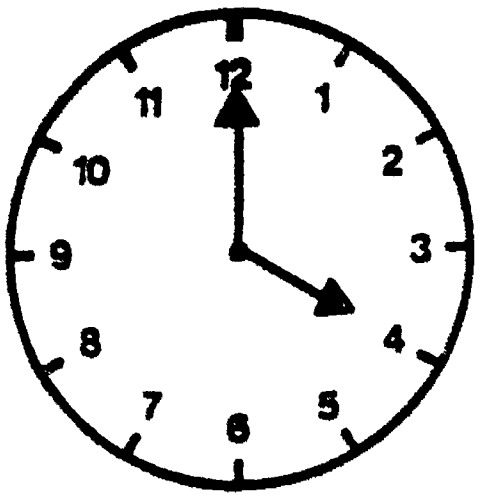
PAGE 2	
11:17	12:07
4:46	6:23
8:53	1:59

PAGE 3			
4:12	12:20	12:04	(4:00)
12:55	(11:00)	11:12	12:11
6:02	2:06	6:10	(2:30)
(7:30)	6:07	8:30	6:40
3:02	(2:15)	3:10	2:03
6:01	1:06	1:30	(6:05)

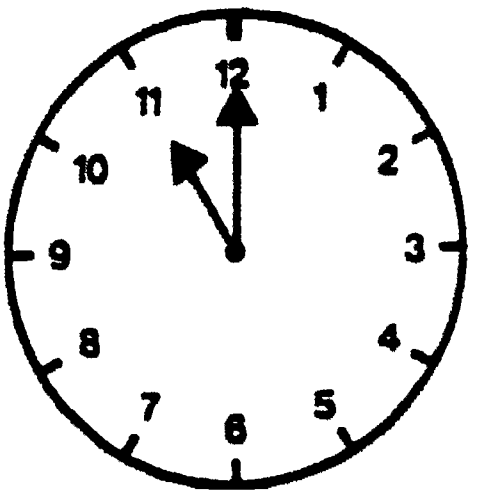
PAGE 4			
(3:40)	8:15	3:08	4:40
12:10	10:00	(11:50)	12:50
10:02	(10:09)	2:50	10:10
5:45	9:05	(9:27)	9:30
5:07	7:25	6:07	(5:36)
(2:52)	3:50	10:15	2:55


12 1 2 3 4 5 6 7 8 9 10 11

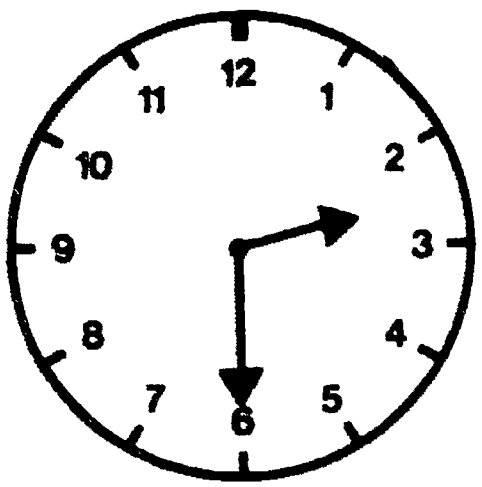




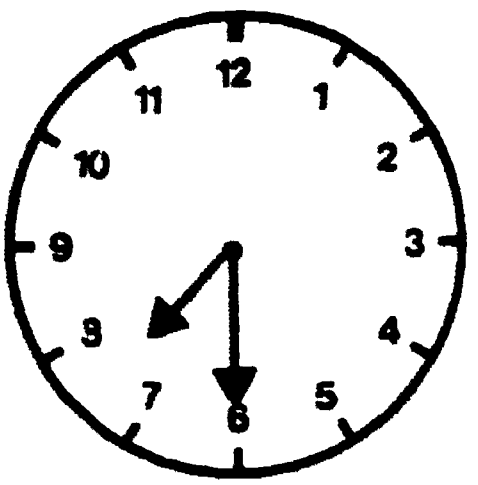
4:12	12:20	12:04	4:00



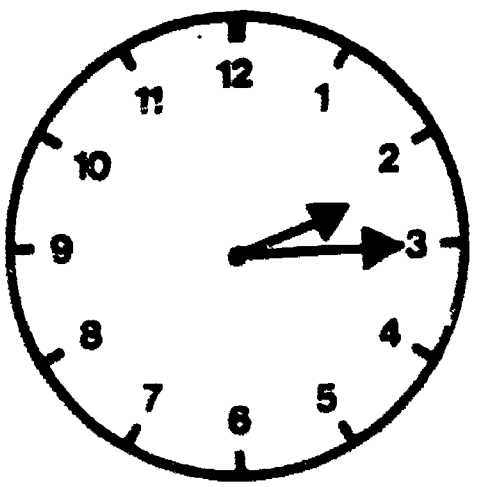
12:55	11:00	11:12	12:11



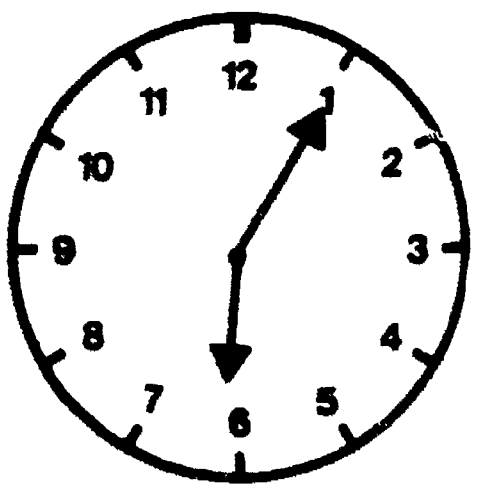
6:02	2:06	6:10	2:30



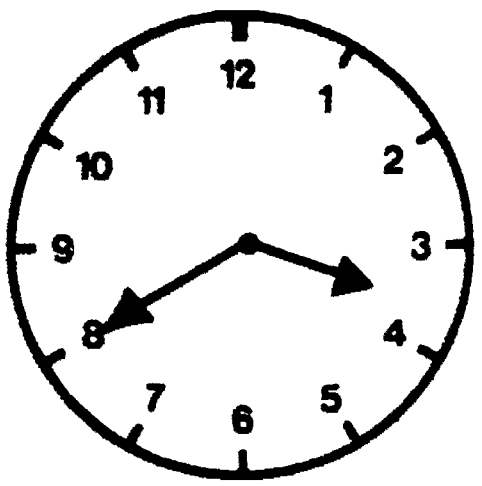
7:30	6:07	8:30	6:40



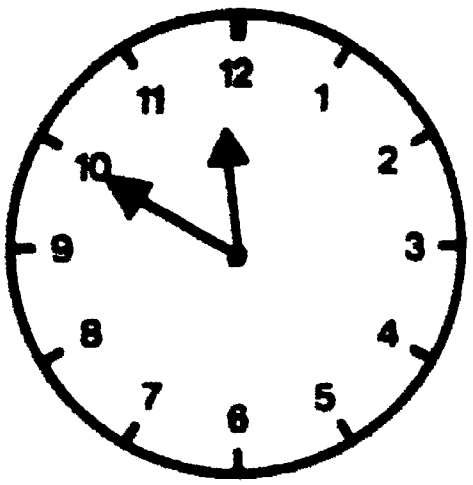
3:02	2:15	3:10	2:03



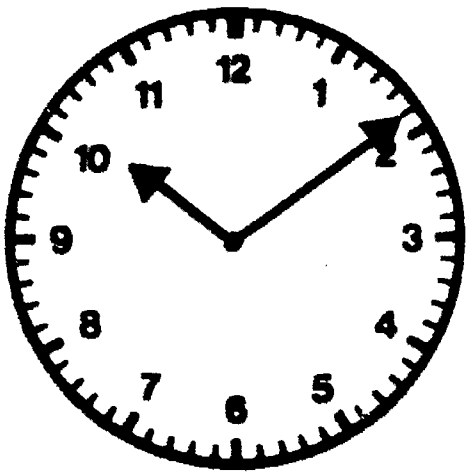
6:01	1:06	1:30	6:05



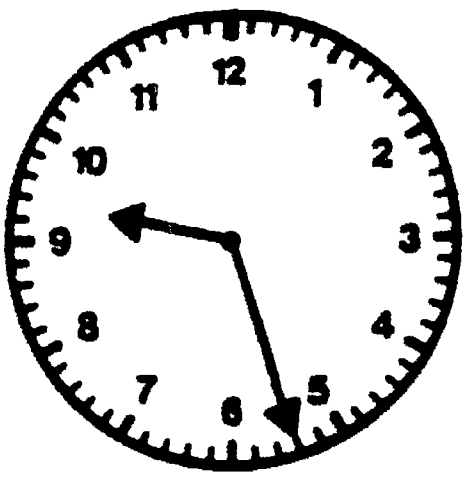
3:40	8:15	3:08	4:40



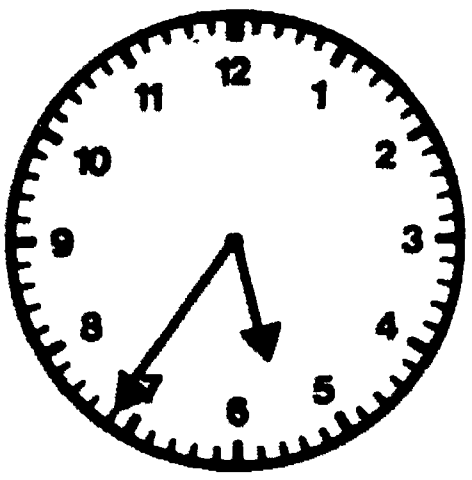
12:10	10:00	11:50	12:50



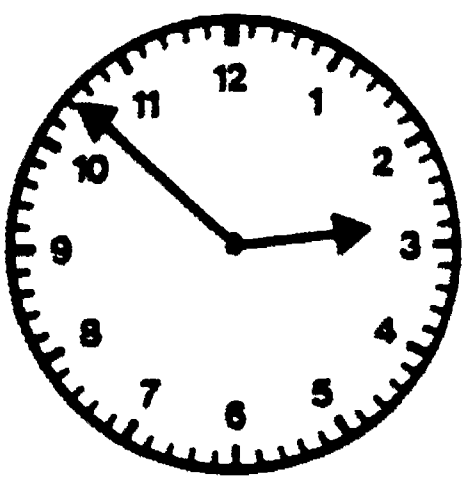
10:02	10:09	2:50	10:10



5:45	9:05	9:27	9:30



5:07	7:25	6:07	5:36



2:52	3:50	10:15	2:55

APPENDIX F

Operating Procedures for Teacher Net System

Teacher Net Operating Procedures

System Configuration

1. Refer to Appendix B for a graphical representation of the Teacher Net hardware.

2. The IBM PC must contain two disc drives and two serial ports. The first serial port is used to connect the Reactive Systems networking device, and the second serial port is used to connect the VID-232 interfact device. Refer to Appendix C for a description of the Reactive Systems device. Refer to Appendix H for a description of the VID-232 interface device.

3. Refer to Appendix C and Appendix H for instructions to connect the Reactive System device and the interface device to the microcomputer.

4. Refer to Appendix H for instructions for connecting the videodisc player to the interface device and the monitor to the videodisc player. A second small black and white monitor should be connected to the video output port of the microcomputer. The individual keyboards are connected to the Reactive Systems network device. Refer to Appendix C. The Teacher Net software operates under MS-DOS and is completely menu driven. The system should be set up in a classroom so that each student has a keyboard, a large color monitor should be positioned for the students to easily see the video presentation and hear the audio presentation, and the second monitor should be located for the teacher to see the individual progress of each student.

System Operation

1. The teacher should start the system and get to the point in the program where the presentation will begin immediately.

2. Students must be assigned specific seats so that they always have the same keyboard.

3. The students should go directly to their assigned seats, and the program should begin immediately. It is important to not give students the opportunity to play with the equipment while they are waiting for the presentation to begin.

4. After the presentation begins, the teacher can circulate among the students to provide remedies and to keep the students on task.

5. The teacher can refer to the second monitor after each response to determine each students response. The presentation on the second monitor will help the teacher determine if individual remediation is required.

6. At the end of each lesson, a quiz is administered.

7. After the system analyzes the results of each students performance during the lesson and each students performance during the quiz, a summary of class performance is presented on the second monitor. A hard copy printout of this report can also be obtained.

8. The summary analysis will indicate if the entire group should repeat the lesson, if individual students should repeat the lesson, and if the student needs additional paper and pencil practice on the concepts convered in the lesson. The system will indicate which paper and pencil practice sheets should be used.

APPENDIX G

Operating Procedures for Level I System

Operating Procedures for Level I System

Program and Equipment

Time Telling is a one-disc videodisc program. The videodisc presents 7 lessons which include instructions, practice exercises, and quizzes. Answer sheets and worksheet exercises coordinated with each videodisc lessons are included.

The course is presented to an entire class and requires a videodisc player, with remote control, and at least one monitor. The monitor should be a color TV set at least 19 tc 20 inches diagonal (25-inch monitors are preferable). If the class is large, two monitors may be needed.

Students

The course is appropriate for students who do not know how to tell time, but who meet the following prerequisites:

1. Identify numbers 1-12.
2. Count by one's.
3. Count by five's.

Presenting a Lesson

The following steps list the procedures for presenting each of the seven videodisc lessons:

1. Set up the videodisc player and monitor. Refer to the User's Manual for your videodisc player and follow the setup procedures as they are presented.

2. Begin work on the videodisc.

    a. Turn on the television and videodisc player.
    b. Place the videodisc in the player so that Side 1 is facing you.
    c. Press the PLAY button on the Remote Control Unit (Refer to the section *Using the Remote Control Unit*).

3. Work through the lesson.

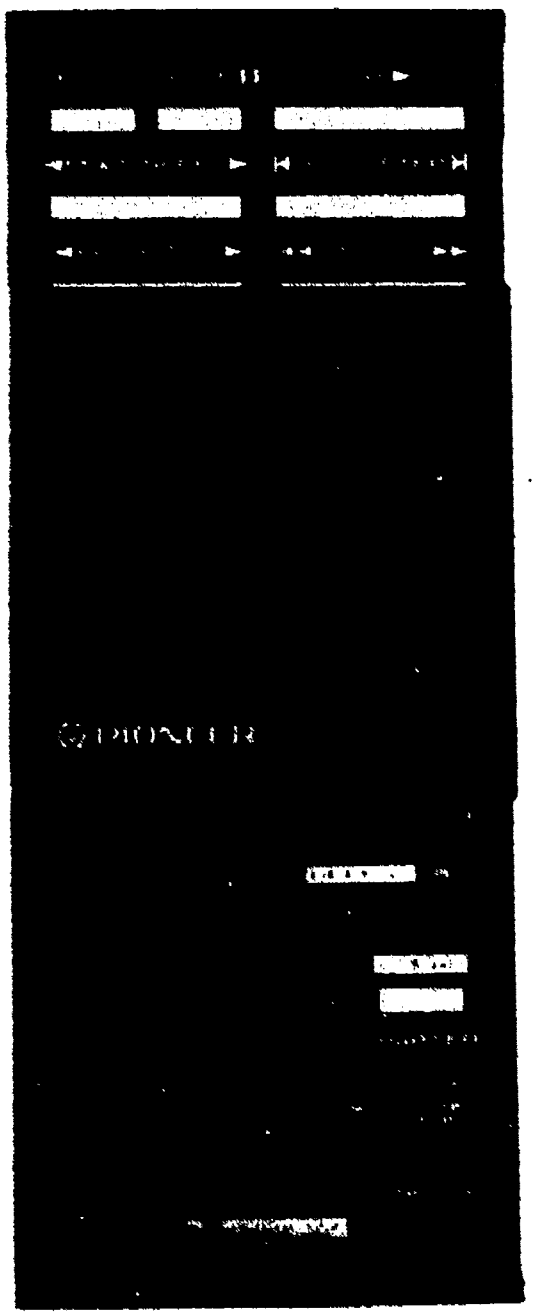
    a. From the Main Menu on the videodisc search to the appropriate lesson.
    b. Proceed with the lesson (Refer to the *Time Telling Lesson Guide*).

Using the Remote Control Unit

The basic keys are: PLAY, PAUSE, STEP, and keys for moving forward and backward. If you press PLAY, the screen displays a motion sequence - like a motion picture. If you press STEP, the screen displays a still frame, like a still photo. There are 54,000 still frames on each side of the videodisc. If you press PAUSE, the screen goes blank and remains blank until you press PLAY or STEP. The STILL key freezes the frame appearing on the screen.

Other keys permit you to move forward or backward on the disc at various speeds: SCAN takes you very rapidly; the FAST key moves the image at three times normal speed; STILL/STEP goes a frame at a time (press STILL repeatedly for backward, STEP for forward). The DISPLAY key will show you your present position on the disc by chapter or frame address.

The remote control keypad permits you to circulate among the students while directing the videodisc player. Most keypads look something like this:



TIME TELLING LESSON GUIDE

Lesson One

PURPOSE: To teach the concept of counting clockwise on a clock through the use of the First/Next Circle.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- 11 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson One. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson One. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson One. These may also be used for remedial work if necessary.

Lesson Two

PURPOSE: Introduce the little hand. The First/Next Circle are still included. No big hand is present. Students will begin writing the number for the little hand in digital format.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section — 11 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Two. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section — 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Two. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Two. These may also be used for remedial work if necessary.

Lesson Three

PURPOSE: Continue work started in Lesson Two. The First/Next Circles are discontinued. Student responds by writing the number for the little hand in digital format. Present the concept that the little hand tells what hour it is. During Part 2 of the lesson, the big hand is present on the clock as a distractor.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- Part 1 10 problems
Part 2 10 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Three. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Three. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Three. These may also be used for remedial work if necessary.

Lesson Four

PURPOSE: Introduce counting by fives in association with telling time.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- 12 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Four. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Four. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Four. These may also be used for remedial work if necessary.

Lesson Five

PURPOSE: Introduce the big hand. No little hand is present. Students will write the number for the big hand in digital format. Present the concept that the big hand tells how many minutes there are, that we use 00 for the 12, and say OH, OH, and that we always read two numbers (so between 1 and 9 we use 01, 02, and so on and say OH one, OH two and so on). During Part 2 of the lesson, the little hand is present on the clock as a distractor.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- Part 1 10 problems
Part 2 10 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Five. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Five. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Five. These may also be used for remedial work if necessary.

Lesson Six

PURPOSE: Introduce combined process of big hand and little hand. Students respond by writing what time the clock says in digital format. Present concept that we say o'clock when the big hand is on the 12.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- Part 1 10 problems
Part 2 10 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Six. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- Part 1 5 problems
Part 2 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Six. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Six. These may also be used for remedial work if necessary.

Lesson Seven

PURPOSE: Introduce the process of counting for the big hand when it points to a little mark (minutes). Students respond by writing the number for the big hand in digital format.

OUTLINE:

I. Instruction Section

Students should respond to all examples out loud as a group.

II. Practice Section --- Part 1 10 problems
Part 2 10 problems
Part 3 10 problems

Step through the Practice Section one frame at a time. At each problem, allow time for students to respond. Students should respond to all problems by recording their answers on the Practice Answer Sheet for Lesson Seven. Then step to the answer screen and check their work. Any errors should be corrected immediately.

III. Quiz Section --- 8 problems

Step through the Quiz Section one frame at a time. At each problem, allow time for the students to respond. Students should respond to all problems by recording their answers on the Quiz Answer Sheet for Lesson Seven. The Quiz will be corrected by the instructor following the lesson.

IV. Seatwork

Use the Review Worksheet and/or Practice Worksheet to give students additional practice with the information presented in Lesson Seven. These may also be used for remedial work if necessary.

APPENDIX H

VID-232 Set Up Procedures

Setting Up Your

Interactive

Videodisc System

Setting Up Your Interactive Videodisc System

The following sections describe a number of interactive videodisc system configurations possible with the VID-232. It should be noted that, while only these configurations are documented, they do not necessarily preclude the compatibility of the VID-232 with other computers or videodisc players. If you have other system needs, please contact us. Generic configuration diagrams for interactive videodisc systems using the VID-232 are shown on the opposite page.

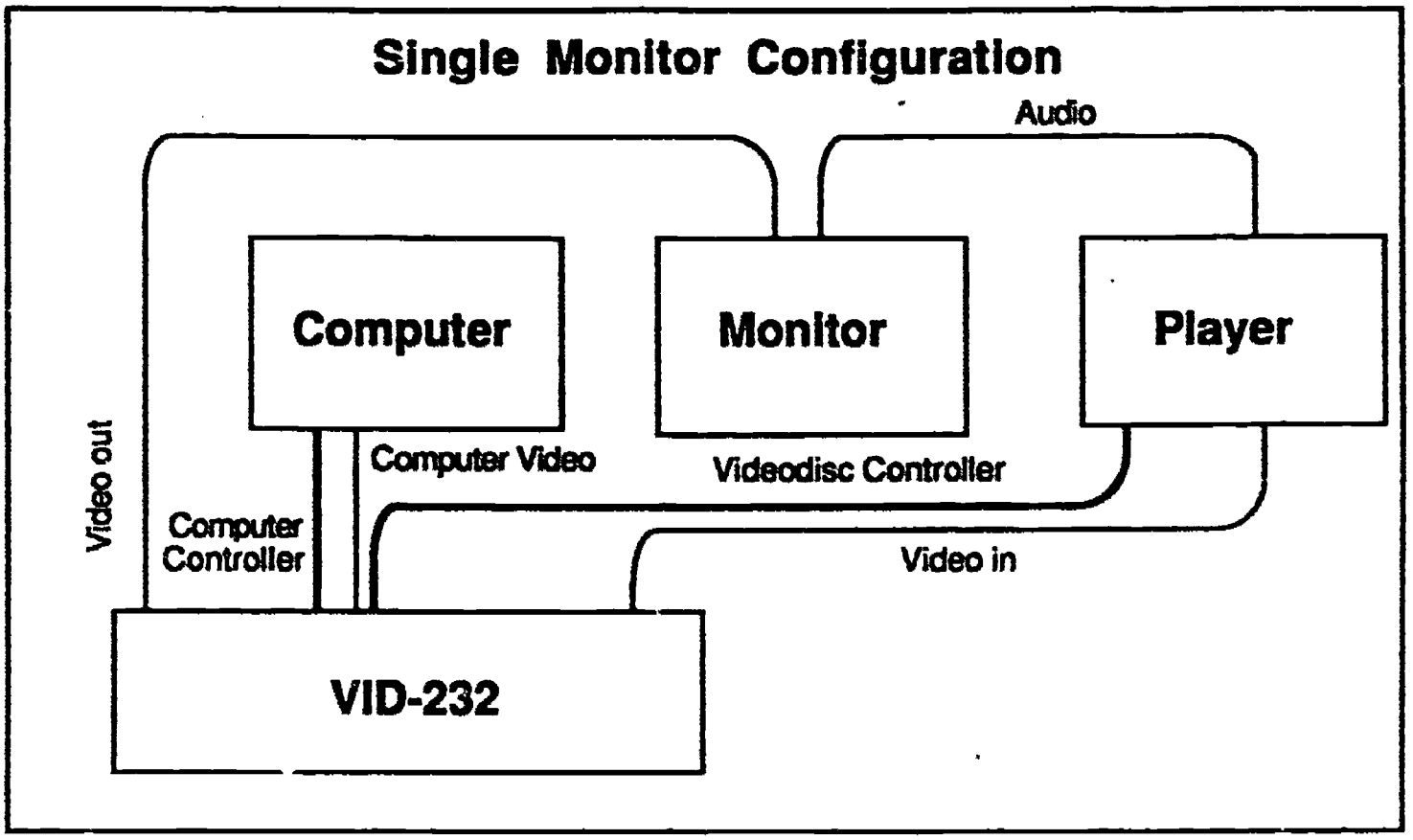
The audio and video cables you'll need to set up your interactive videodisc system are included with the package. However, some of the cables required for your interactive videodisc system are not standard. Controller cables for the computer and videodisc player you will be using with the VID-232 are available from Systems Impact. Pin configurations for necessary cable connections are shown in Appendix B if you wish to construct your own cables. Additional cable kits are available if you wish to use your VID-232 with different system configurations.

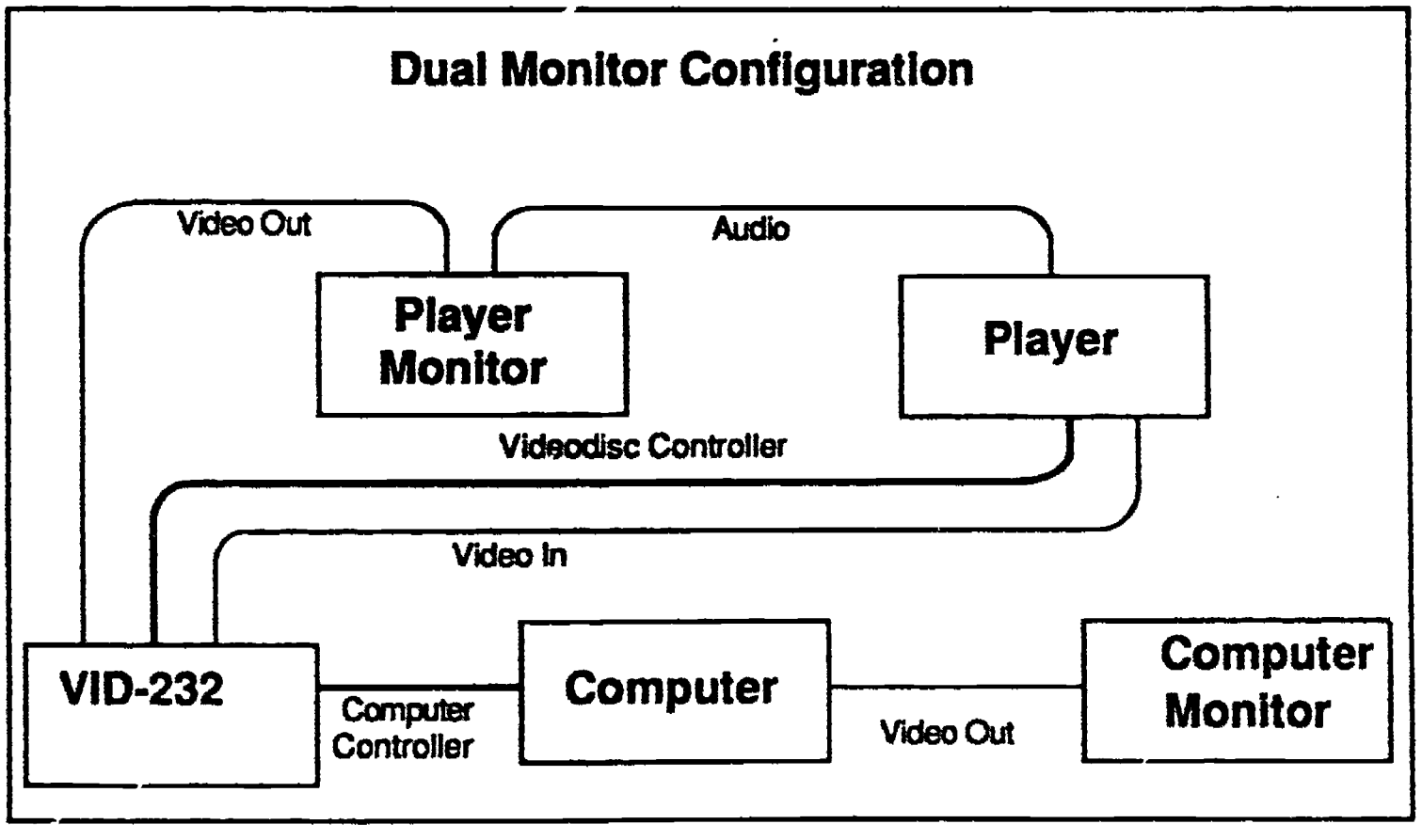
Setting up the VID-232 requires three steps:

1. Connect audio, video, and computer controller cables;
2. Connect videodisc controller cables; and
3. Set front panel switches for proper videodisc player and baud rate.

To set up your system, first turn to the section of the manual for your computer and follow the step by step directions. The set up instructions given are for a single monitor configuration. If you wish to use a dual monitor configuration, refer to the dual monitor configuration diagram on page 5. Next, turn to the section of the manual for your videodisc player and follow the set up directions. Finally, turn to the section of the manual for front panel switch settings and set the switches to the setting appropriate for your computer and videodisc player, then follow the instructions given in the system start up. The table on page 6 gives the sections for each computer and videodisc player.

VID-232 Generic Configurations





Before you start

The audio and video cables suplied with the VID-232 are appropriate for most monitors. The supplied cables will fit monitors with:

BNC Video In
RCA Audio In

If your monitor's audio in or video in are different, you will need to purchase the appropriate adapters or substitute appropriate cables.
(Note: LD-700 users, the video cables supplied with the VID-232 will need an adaptor (BNC to RCA Male) since the LD-700 uses RCA jacks for video out.)

The RF Modulator may be used with a television instead of or in addition to the player monitor. If a television is used, the audio should be rerouted to an external amplifier and speaker.

IBM PC or PC/XT

Equipment required:

IBM PC or PC/XT
VID-232
Standard cable kit (RCA to RCA audio, 2 BNC to RCA video, RCA to RCA video)
(note: since the IBM PC or PC/XT video is not compatible with player video, two monitors [one for computer video and one for videodisc video] are required)
Controller cable for IBM PC or PC/XT
Serial interface card **(either IBM Asynchronous or Quadboard II)**
Appropriate videodisc controller cable
Videodisc player
2 monitors

1. Place the IBM PC or PC/XT, videodisc player, monitors, and VID-232 in the locations you desire.

2. Locate the RCA to RCA audio cable. If only audio channel one is needed, connect the cable to the **1/L audio out** jack on the videodisc player. If only audio channel two is needed, connect the cable to the **2/R audio out** jack on the videodisc player. If both audio channels are needed, connect a Y cord to audio out jacks **1/L** and **2/R** on the videodisc player and connect the RCA cable to the Y cord. Connect the other end of the RCA cable to the **audio in** jack on the monitor.

3. Locate one BNC to RCA video cable. Connect the BNC end to the **video out** jack on the videodisc player. Connect the RCA end to the jack labeled **Disc Video In (see figure opposite)** on the rear of the VID-232.

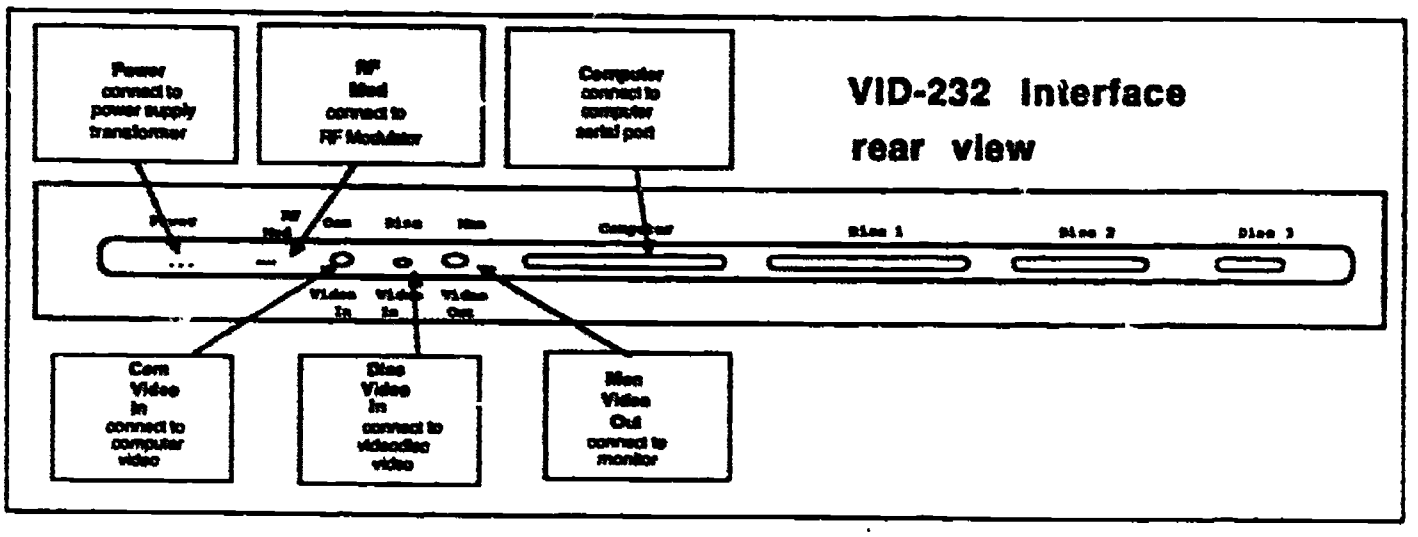
4. Connect your IBM PC or PC/XT to your IBM monitor.

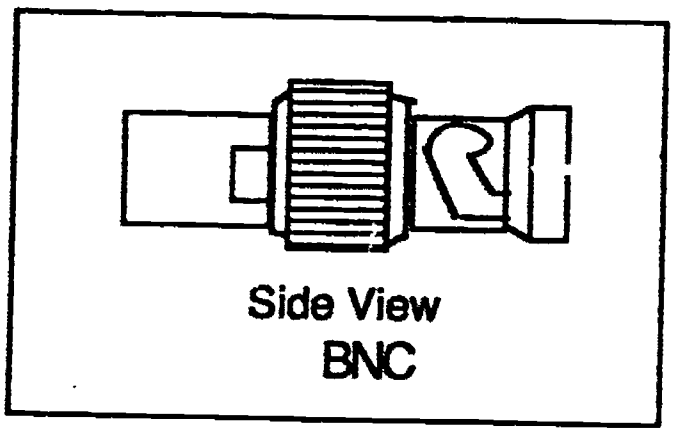
5. Locate the other BNC to RCA video cable. Connect the BNC end to the **video in** jack on your monitor. Connect the other end to the jack labelled **Mon Video Out** on the rear of the VID-232. **(Note: If desired, steps 3 and 5 may be substituted by connecting the cable directly from the videodisc player to the monitor.)**

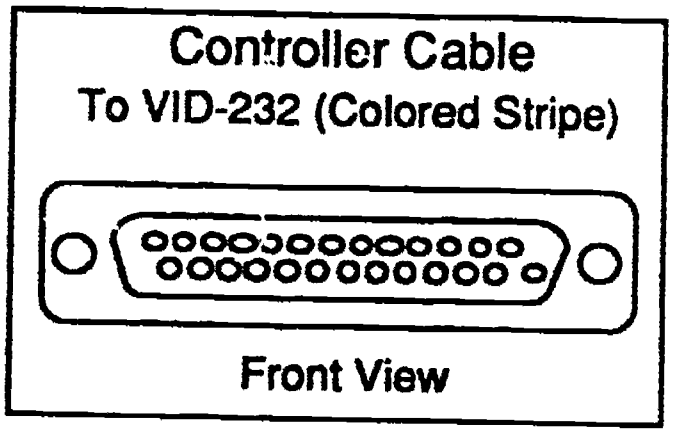
6. Locate the IBM PC or PC/XT to VID-232 controller cable **(see figure opposite)**. Connect the end with the colored stripe to the jack labeled **Computer** on the rear of the VID-232 interface. Connect the other end to the serial interface card in your IBM PC/XT.

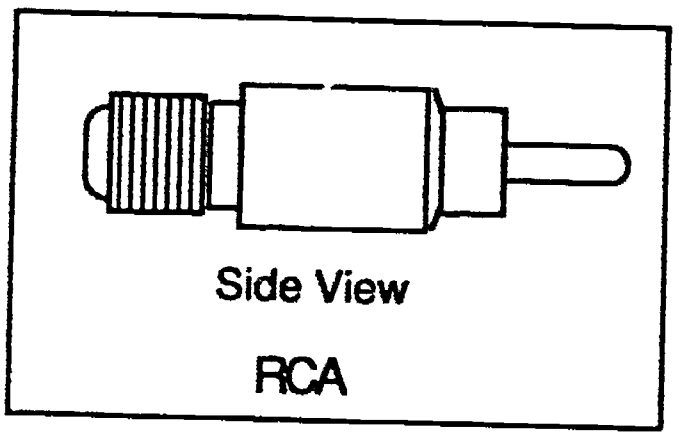
7. Locate the power supply. Connect the flat cable to the three pin Power jack located on the left rear of the VID-232 (see figure below). The jack can only be connected one way since one hole of the power supply plug is blocked.

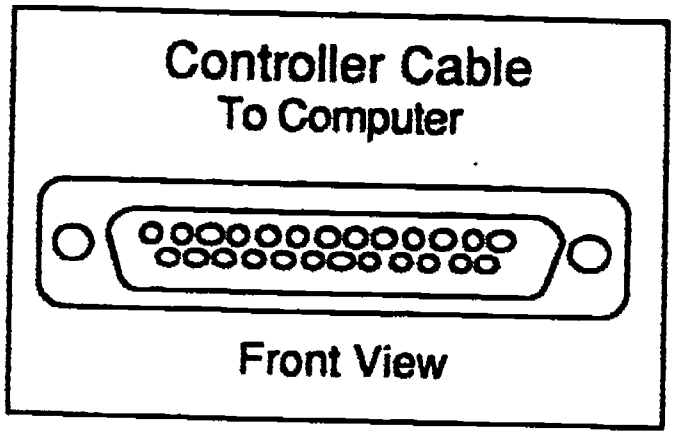
8. The final cable to be connected is the videodisc player to the VID-232 controller cable. Refer to the appropriate section for directions on connecting the videodisc player to the VID-232.





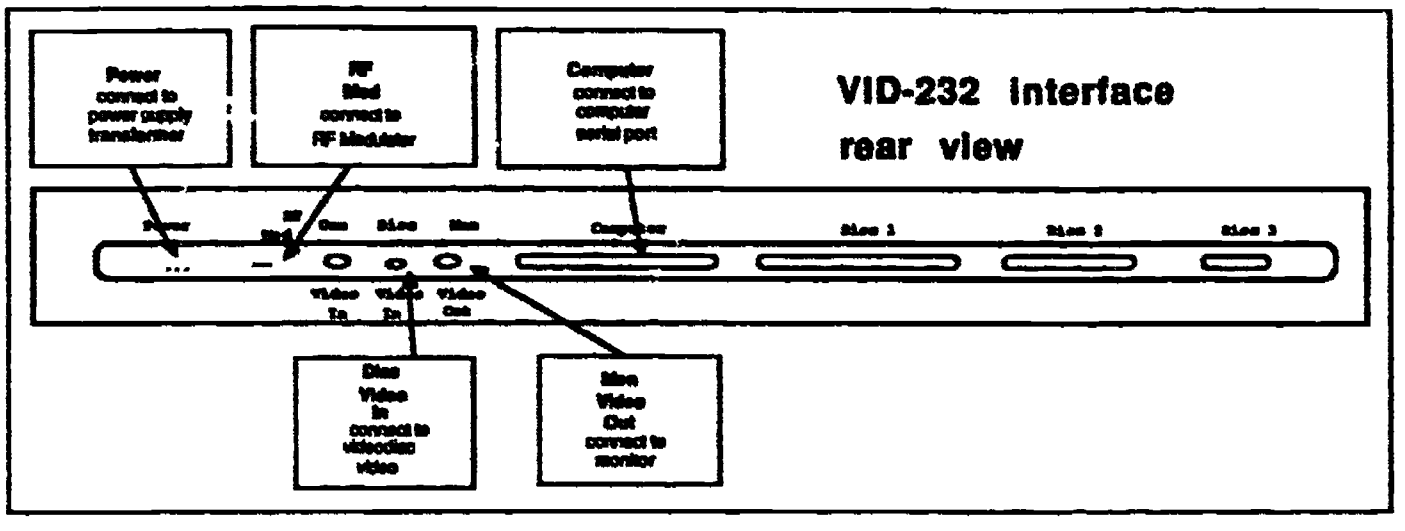


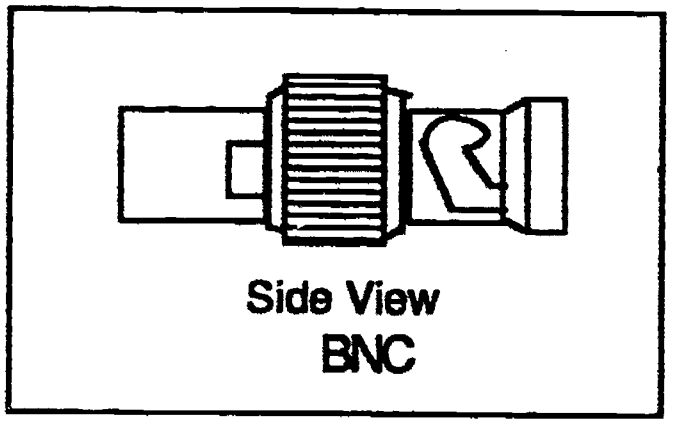


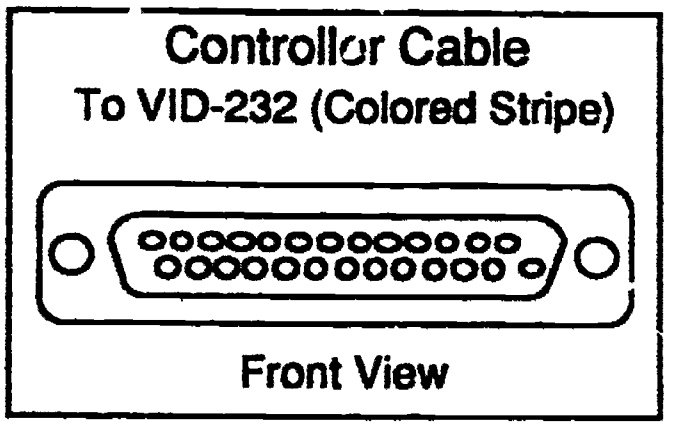


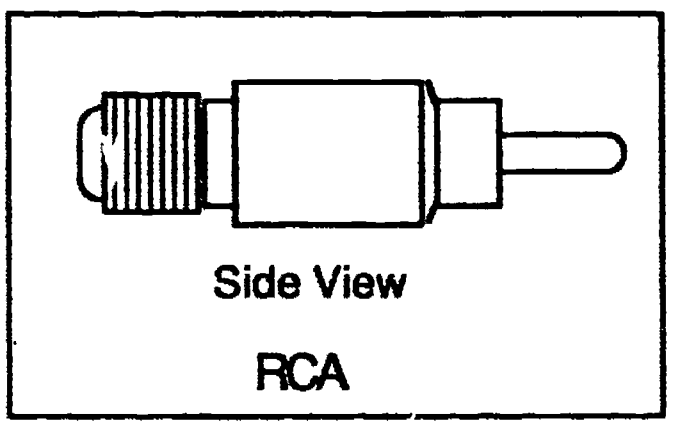
7. Locate the power supply. Connect the flat cable to the three pin Power jack located on the left rear of the VID-232 (see figure below). The jack can only be connected one way since one hole of the power supply plug is blocked.

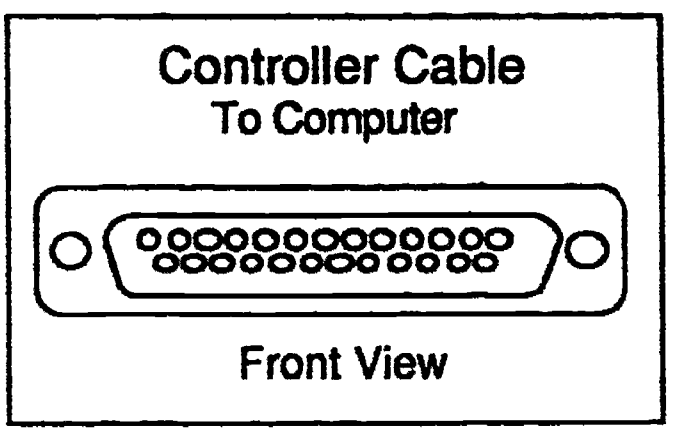
8. The final cable to be connected is the videodisc player to the VID-232 controller cable. Refer to the appropriate section for directions on connecting the videodisc player to the VID-232.











Videodisc Player

Set

Up

Pioneer LD-V6000

1. Locate the videodisc to VID-232 controller cable (see figure below).
2. Insert the end with the colored stripe into the jack on the rear of the VID-232 marked Disc 1 (see figure below).
3. Insert the other end into the jack on the rear of the LD-V6000 marked RS 232C.
4. Set the DIP switches on the rear of the videodisc player (see figure below). In the figure below, the black square indicates the position of the DIP switch (e.g. 1 - up, 2 - down, etc.).
5. Now turn to the switch setting section on page 28.